# Light and Lighting

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## Parliament and Science

NEVER was there a time when science had so great an impact upon the life of the people as it now has. The prosecution of scientific research and the application of its results are so vital to us that they must be encouraged, and prompted when necessary, by Parliament. Scientific research on an adequate scale for the interests of industry, agriculture and health—to say nothing of research for defence—could not now be carried on without funds voted by Parliament; nor could the universities train the scientists we need without such funds. A close liaison between parliamentarians and scientists is essential to-day, and this is the aim of the Parliamentary and Scientific Committee which has recently made its report for 1952. This body consists of members of both Houses of Parliament and of representatives of numerous scientific bodies, including the I.E.S. At its recent annual luncheon, H.R.H. The Duke of Edinburgh stressed the need for the wider and more rapid practical application of scientific knowledge—the need for the utilization of science to become fashionable. We hope that in some measure we are helping to make fashionable the utilization of science in lighting.

# *Notes and News*

## *Road Safety at Night*

The subject of road safety is one with which every man, woman and child is vitally concerned. As individuals, however, we are rather inclined to think that "measures" to safeguard our lives are the responsibility of "the authorities" and little think what we ourselves can do. When measures are put into operation and fail to produce spectacular results we are too liable to condemn them without giving careful consideration to all the facts; as witness the zebra crossings which have undoubtedly reduced the number of road casualties but which are strongly opposed in some quarters.

One source of danger on the roads at night is the dazzling headlights of oncoming cars. The Traffic and Safety Division of the Road Research Laboratory, whose primary function is to save life on the road, have for a number of years been studying the difficult problems of reducing dazzle and improving the range of vision of drivers. They have now put forward some recommendations which, though not providing a complete solution, will if adopted by conscientious vehicle owners make a considerable contribution towards reducing accidents at night.

Headlamp dazzle has two effects, it causes discomfort and annoyance and it also reduces the distance a driver can see. Tests on the road have shown that under present conditions when cars are approaching with dipped headlamps neither driver can, as a rule, see more than 120 ft. ahead. Even at a speed of 30 m.p.h. this distance is covered in less than three seconds which is insufficient to allow the car to be stopped if an obstacle suddenly presents itself. With glaring headlights this distance is even less. It is possible to reduce discomfort by reducing the brightness of the beam but this also shortens the seeing distance. The R.R.L. has therefore concluded that the brightness used should not be a low one.

The information collected by the R.R.L. during its "dazzle survey" is most enlightening. They checked on several hundred cars on the road during driving tests and found that 17½ per cent. of headlamps caused dazzle sufficient to worry the driver, 1½ per cent. being from undipped lamps, 9½ per cent. from dipped lamps and 6½ per cent. being from passlights. Some hundreds of cars were also given a detailed examination and their headlamps checked. This showed that only about 1 per cent. of headlamps were correctly adjusted within ½ degree and over 42 per cent. were *more* than 3 degrees out in adjustment. The percentage of maladjusted lamps is even greater in the case of commercial vehicles. The results of the tests also show that extensive deterioration in the efficiency of headlamps can occur without drivers doing

### *Next I.E.S. Meeting in London*

The next I.E.S. sessional meeting in London will take place at 6 p.m. on Tuesday, March 10, at the Royal Society of Arts, John Adam Street, W.C.2. At this meeting the Report on the Lighting of Office Buildings (Post-War Building Studies No. 30) will be discussed. The discussion will be opened by Mr. P. V. Burnett, F.R.I.B.A., who was chairman of the committee, appointed by the Building Research Board, which prepared the Report.

anything about it; 12½ per cent. of dipped headlights were found to have a maximum intensity less than one-tenth of what they were designed to give.

The effects of maladjustment and deterioration have been demonstrated at the R.R.L. With modern headlamps on both cars the viewing distance of one driver using correctly adjusted headlamps approaching a vehicle with lamps out of adjustment by only ½ degree is reduced by half; if the headlamps on both cars are out of adjustment the viewing distances of both drivers are reduced even more drastically. It would hardly be going too far to suggest that vehicles with badly deteriorated headlamps are a menace to other road users and should not be allowed on the roads after dark.

If all headlamps were of the same design and power the problem would be eased but the most important thing at the present is to improve the aiming of the beam and the maintenance of the headlamp—and these are things which all vehicle users should attend to with the satisfaction of knowing that they are then far less likely to be the cause of an accident and are themselves contributing something towards road safety.

The recommendations of the Road Research Board are as follows:—(1) The standard of headlight aiming should be improved. (2) The intensity of beams should fall within certain limits which would eliminate both the feeble and the excessively bright lights. (3) Steps should be taken to secure a high degree of conformity with the standards of aiming and intensity of the beams. (4) New headlamps should all give beams of the same distribution.

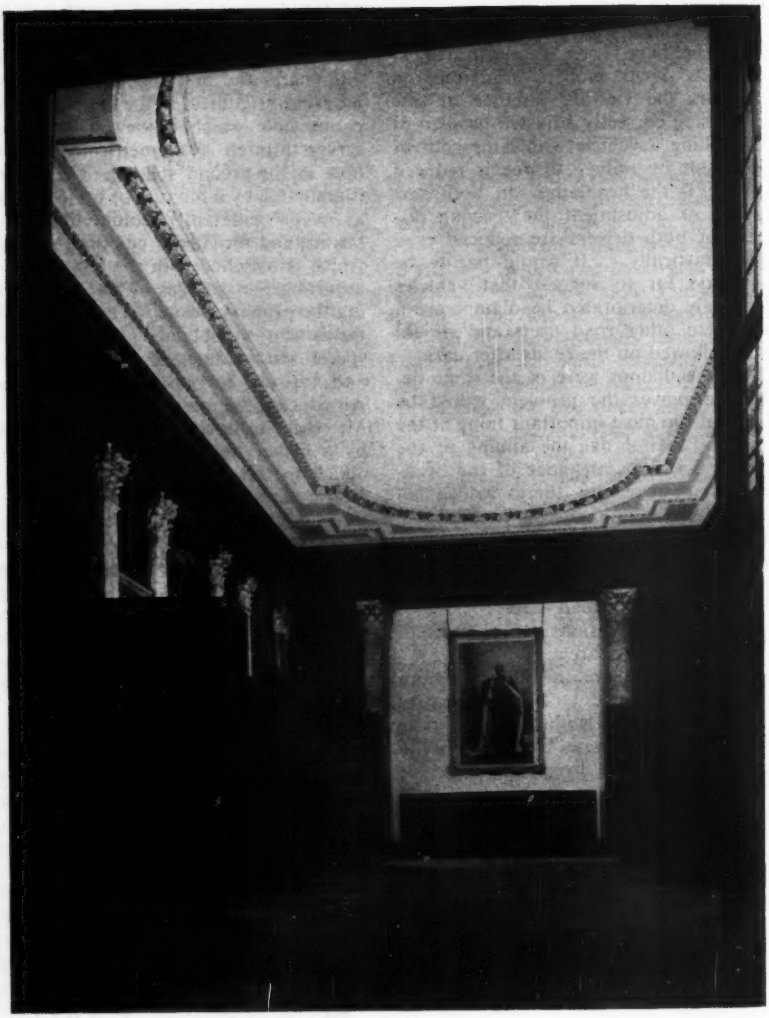
If every motorist would give conscientious attention to the first three of these recommendations a further step would have been taken to make our roads safe.

## *Novelties in Colorimetry*

In a triple bill at the Physical Society's Colour Group on January 7, Professor Cotton, Mr. Hunt and Mr. Donaldson described instruments and methods of colour measurement embodying various novel features. The colorimeter devised by Professor Cotton employs two 8-in. whitened spheres placed together with a small inter-communicating hole at their point of contact. The light under test illuminates the first sphere and produces a diffuse brightness in the inter-communicating hole which is viewed by the observer through a diametrically opposed hole in the second sphere. The latter is illuminated by a mixture of up to as many as seven differently coloured primary beams, and provides a coloured surround which is matched with the test colour by adjusting the voltages of the lamps feeding the primary beams. The very flexible instrument so obtained is intended for special studies (e.g., of colour-rendering) and for use for instructional purposes. An educational motive had also prompted Mr. Hunt to devise his instrument which by a clever use of desaturating colours added to the test colour enables colorimetric settings to be made directly in terms of the standard reference primaries of the C.I.E. System. Mr. Donaldson's contribution was concerned with the new colorimetric problems created by the use of fluorescent materials. He described the apparatus he had developed for determining the colours of such materials under illuminations of any prescribed energy distributions. He showed that in many cases the colour properties of a fluorescent material could be specified by giving, instead of a single curve of reflection factor against wavelength, three curves, representing the contributions to the C.I.E. trichromatic co-ordinates of the "reflected" light for equal energies of monochromatic incident light throughout the spectrum. From the lively discussion it was apparent that further measurements by Mr. Donaldson would be awaited with much interest.

## *Physical Society Exhibition*

The thirty-seventh annual exhibition of the Physical Society will be held at the Imperial College of Science and Technology, London, from April 13 to 17. Applications for tickets, stating day required, may be made to the Physical Society.



*Lighting fittings concealed in the top of the bookcases illuminate the library at Australia House.*

# Office Lighting in Germany

**Office lighting is of topical interest and it is interesting to compare practice in Germany, as described below, with that in this country and in the U.S.A. which have been dealt with in recent articles.**

By E. von der TRAPPEN*

The number of medium-sized or larger business and industrial concerns in Western Germany which are not now engaged in changing their lighting system from tungsten to fluorescent lamps is fairly small. The existence of the fluorescent lamp has determined very largely the modern conception of illumination requirements for interiors in industry and commerce. On the whole public authorities and large administrative bodies still make little use of the new light source. This is largely due to their restricted financial resources. Even in these quarters, however, it is now understood that fluorescent lamps have many advantages over the filament lamp, but the high costs involved weigh heavily in all considerations and the initial expense of installing new schemes very frequently bars the way to modern and up-to-date lighting schemes based on fluorescent lamps.

There is, of course, more than one way of applying fluorescent lamps in offices, but, basically, the ideas on the arrangement of such schemes and the type of fittings to be used differ little. One may be tempted to arrange for the artificial light to come from the direction of the window, but few examples of this kind of treatment are to be found. Where lighting in the home is concerned it is understandable that people are reluctant to install artificial light sources near the window. The custom of having the fitting positioned in the middle of a room serving as drawing-room, bedroom, or kitchen is firmly rooted in the minds of most people and will not be abandoned easily. But the lighting of offices is a different matter. Here it is quite normal to have the furniture in positions which are unlikely to be changed for many years. Also, as a rule, all desks, or boards in drawing offices, are deliberately placed in such a manner that the best use is made of the incoming daylight. Therefore it makes sense to have the artificial light sources located near the window. A particularly useful arrangement of fluorescent lamps to facilitate this is shown in Fig. 1. Two arms holding a panel of translucent glass in a sloping position are fastened to a bar which, at the same time, supports the case housing the auxiliary apparatus. The same arms carry a louvre frame slightly inclined against the horizontal. As a result the light is directed into the room at a somewhat oblique angle. The wattage is rather more than would be required for a tungsten lamp fitting suspended in the middle

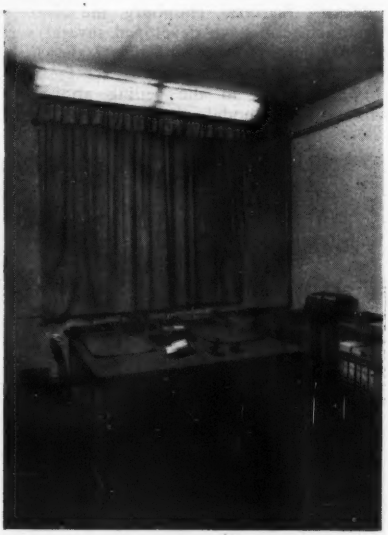


*Fig. 1. Fluorescent fitting above a window giving between 20-27 lm./ft² on the desk.*

* Dr. Ing., Deutschen Philips, G.m.b.h.

*Fig. 2. The lighting in this office is provided by fluorescent lamps in channels in the ceiling above the window.*

of the room. Another alternative would be that of dispersing the fluorescent lamps over the ceiling. Nevertheless, the arrangement illustrated in Fig. 1 is considered to be very good. Of course, such arrangements always need efficient reflectors.

Messrs. Kyriazzi, Hamburg, the cigarette manufacturers, have developed several very original lighting schemes. Fig. 2 shows the office of a manager. Troughs, some 10 cm. deep, provided in the ceiling above the window accommodate the fluorescent lamps. The light distribution in the room after dark varies little from that during the day and, in actual fact, the decrease of illumination between the area near the window and that near the opposite wall is more uniform than that of proper daylight. The person occupying the room is very pleased with the lighting—proof of the fact that this type of arrangement has its uses.

The same company employs a similar lighting scheme in a large office (Fig. 3). Here, two lines of fluorescent lamps form a strip of light above the windows. In addition, single 20-watt fluorescent lamps, 60 cm. long, are fitted to the pillars evening up the illumination of the room and at the same time serving a decorative purpose. Where the ceiling is low, such light strips can cause a certain amount of eyestrain to the occupant of the room. The provision of louvres, however, and the use of diffusing glass panels will reduce the brightness to the desired value and eliminate glare Screens of this or any other kind are indispensable in this connection. The area between the two pillars in Fig. 3 is illuminated at approximately 17.5 lm./ft.$^2$

Fig. 4 shows an assembly of 60-cm. fluorescent lamps fitted to the ceiling of a staircase in a central position. The light coming from this source is augmented by the light coming from individual lamps, also 60 cm. long and installed on each floor, let into the wall and covered by diffusing glass panels. Fig. 5 shows a different design of the same type of fitting suitable for large

*Fig. 3. Showing a similar lighting arrangement to that in Fig. 2 but in a larger office. 40-watt lamps are used above the windows and 20-watt lamps on the pillars.*

*Fig. 4. Showing decorative fitting at the top of a staircase well.*

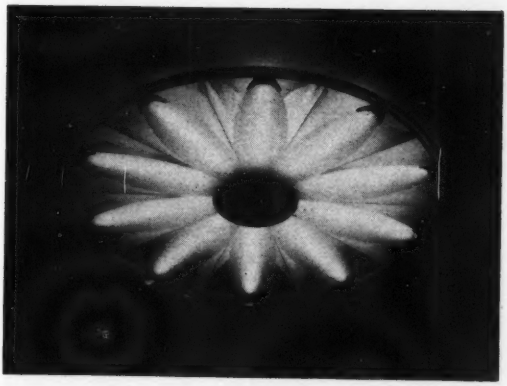


*Fig. 5. Another ceiling fitting consisting of ten 40-watt lamps with wing-shaped reflectors screened by diffusing glass.*

rooms. The lighting effect is excellent and the appearance of the fitting highly decorative.

Fig. 6 shows a solution of the problem of how best to apply fluorescent lamps in small rooms with a very low ceiling. The picture shows a reception room lit by fluorescent lamps. The lamps pointing in an upward direction effectively counteract the visitor's impression of being in a room with a very low ceiling.

More elaboration is required for the lighting of conference rooms or other representative interiors. Fig. 7 shows the conference room of the German Philips Company in Hamburg,

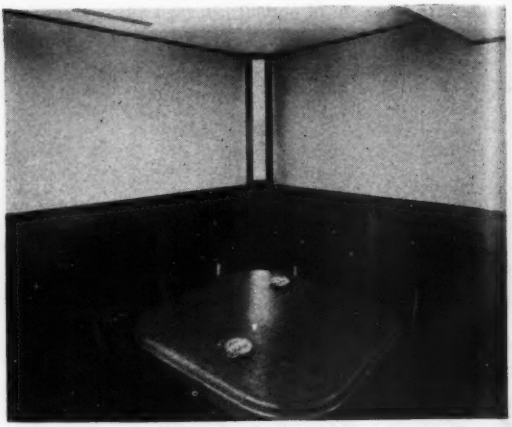


*Fig. 6. Showing application of 20-watt fluorescent lamps for lighting of rooms with low ceilings.*

*Fig. 7. Indirect lighting in a board room.*

*Fig. 8. Showing an application of recessed louvred fittings, each of which contains four 40-watt lamps.*

which is indirectly lighted by tubes let into the cornice and also recessed in the centre of the ceiling. It is often said that this type of lighting is tiring on the eyes, but this is only correct up to a point. It is certainly true that in many cases where this type of lighting is used it has been necessary to provide additional decorative lighting fittings.

Frequently the lamps are placed in housings let into, and flush with, the ceiling. Louvres are used to prevent the actual lamps being seen. The louvres are made from a large variety of materials, e.g., sheet metal, cast glass or individual glass panels. In rooms where the atmosphere is very smoky, certain types of louvre materials may lose their colour finish, and thus their transmission capacity, taking on a yellowish-brown appearance. A lighting arrangement of

*Fig. 9. The main entrance of a town hall in which an unsuitable fitting has been used.*

*Fig.* 10 (*above*). *A louvred fitting for corridor lighting.*

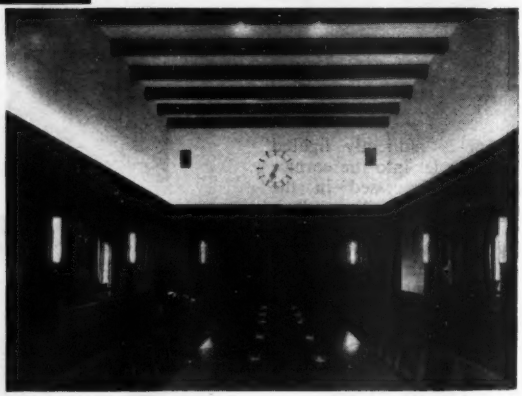


*Fig.* 11 (*right*). *Fluorescent lighting in the council chamber of a town hall.*

this kind can be seen in Fig. 8. The shapes of the casings let into the ceilings vary appreciably. Sometimes they consist of large rectangles which cover the greater part of the ceiling, and sometimes they form strips running in parallel or crossing each other.

There are instances where reception offices, conference rooms or other representative interiors are illuminated by fittings which are constructed exclusively from louvre components. Such designs are not always completely successful. Much depends on the details of the design chosen. Fig. 9, for instance, shows a design which could be improved. The sockets of the lamps are still visible and could easily be screened by placing a fluorescent lamp in front of them. In actual fact, it is now the custom to cover sockets with sheet-metal cases when designing fittings of this type.

The German lighting industry has developed a great variety of fittings for fluorescent lamps, but it does not appear worth while adding to the pictures already shown, as the industry in Great Britain has produced many different shapes and forms, as we have noted with interest from the pages of *Light and Lighting*.

Fig. 10 shows a typical form of corridor lighting. It consists of a continuous light strip fitted to the centre of the ceiling. The louvre fitting is slotted on both sides, facilitating the emission of light on to the upper areas of the corridor walls.

Fig. 11 shows the chamber of a town hall. The general lighting is provided by fluorescent lamps placed in a cornice along the walls. In addition, there are 60-cm. vertical fluorescent lamps at a number of places round the walls.

It is no longer exceptional to see all floors and all rooms of whole office buildings equipped with fluorescent lighting. Originally the colour used was "white," but lately one prefers the application of the "de luxe" fluorescent lamp which gives a better reproduction of the daylight colour.

In conclusion, it can be said that the advent of the fluorescent lamp originated a new trend of design for the lighting of interiors, and although in a few isolated cases architects were reluctant to make use of the new light source, many new ways of approach to office lighting have been opened up.

# Vision and the Nervous System

**An account of the second Trotter-Paterson Memorial Lecture given this year by Dr. E. D. Adrian, O.M., P.R.S.**

On Wednesday, January 28, at the Royal Institution, the second Trotter-Paterson Memorial Lecture was delivered by Dr. E. D. Adrian, O.M., President of the Royal Society and Master of Trinity College, Cambridge. The lecturer was introduced by the president of the Illuminating Engineering Society, Dr. W. J. Wellwood Ferguson, who briefly outlined the circumstances in which the lecture had been founded.

Dr. Adrian took as his subject "The Nervous Reactions of the Retina," and began by apologising for "having no story to tell" because, he said, although the physiologist had accumulated a great deal of information about the eye, little of it had a bearing on practical problems of illumination. He then paid tribute to the memory of the two great illuminating engineers in whose memory the lecture had been founded and referred to the Coutts-Trotter research studentships at Trinity College, founded by the half-brother of A. P. Trotter. He also mentioned that A. P., who came up to Trinity College in 1876, transmitted speech by telephone across the Great Court of Trinity in the following year.

Turning then to the subject of the sense organs, Dr. Adrian emphasised that the physiologist spent most of his time explaining why the body worked as it did—he was rarely able to suggest any new way of making it work better. Most of what we knew about human vision had been established by the end of the nineteenth century, but during the last 20 years or so we had learnt a great deal about the minute structure of the eye, its photochemistry and the signals it sent up to the brain. Our bodies, he said, were constructed with sense organs to detect changes in the world around us and a nervous system to make us react appropriately. This reaction was often a fairly simple and immediate adjustment, like blinking at a bright light, but the nervous system could also carry out much more complicated adjustments, involving an intelligent plan of action based on memory of past events.

The physicist was mainly interested in the two terminal processes involved, the relation between the stimulus and the sensation, but the physiologist wanted to find out all that he could about the intermediate links in the chain, the action of the stimulus on the sense organ and of the sense organ on the central nervous system.

### Sight the Most Important of the Senses

The lecturer said that for many kinds of animals other than man, the dominant sense might be hearing, or smell, or touch, but for man, the monkeys and the birds, vision was by far the most important of the senses. In fact the other kinds of sensory information lost half their effect if they were not reinforced by vision.

As our chief guide to intelligent action, visual experiences had to be a reasonably faithful record of the environmental scene; they were therefore of great complexity and they had to be capable of analysis, measurement and classification. It would, however, be a mistake to suppose that the information furnished by our sense organs was ever a strict mental counterpart of the sensory message, and this was especially so in the case of vision. The nervous system, said Dr. Adrian, dealt with the picture thrown on the retina as the editor of a newspaper would do. The important information was underlined, perhaps exaggerated and given a more definite twist and was presented to the brain as clearly as possible, while the unimportant details and the gaps left by any deficiencies

in the reporting system were put in the background, so that they could be found only if a special search were made for them—as could, in fact, be done in order to show up, for instance, the blind spot in the retina. There was, further, the important fact that the sense organs were specially affected by a *change* in the environment. News should refer to new events, the changes rather than the steady background, and so for the purposes of the brain the sensory system was much more concerned with changes in the stimuli reaching it than with their absolute value. With all sense organs there was always a tendency to come into equilibrium with new surroudings and therefore to react much more when these were changing than when they had changed. Further, they reacted more to a change that was abrupt than to one that was gradual.

Thus, said Dr. Adrian, what we "saw" was a considerably idealised version of the pattern of light on the retina, but there was nothing to tell us at what level the "editing" was done. Much of it undoubtedly occurred in the brain, but some could take place at a lower level, in the retina or in the brain stem. This point was of no consequence when designing a lighting scheme, but it was vital when dealing with disorders of vision such, for example, as colour blindness.

### Interaction between the Retinal Elements

Turning to the nervous activities of the retina, Dr. Adrian mentioned that of the sensitive elements, 95 per cent., or over 100,000,000, were rods leading to the 500,000 fibres in the optic nerve by converging pathways, linked together by cross connections in the retinal network. With the 3,000,000 cones there was less convergence, and those in the fovea, responsible for high visual acuity, were credited with having a single optic nerve fibre each. If the grouping of the rods and of those cones outside the foveal area were a simple one, the effect would be merely to enlarge the receptive area for each transmission line, but the existence of cross connections in the retina (which Dr. Adrian illustrated by means of slides) made it difficult to draw any clear line between one receiving unit and the next. There were two regions in which interaction might occur, because each signal was handed on from the receptor cell to a bipolar nerve cell in the retina and then to the ganglion cell, which sent out the optic nerve fibre, and Dr. Adrian explained the possibility that there might be interaction between the signals from points as far as 1 mm. apart on the retina.

Cajal worked out the nervous pathways through the retina some 50 years ago, but our knowledge of what traverses them is much more recent and comes from records of the electrical activity of the optic nerve fibres. The signals sent along these fibres consist of repeated brief impulses which can be studied by recording the electrical potential between two points on the nerve fibre. So far it has not been possible to record the initial signals, those which travel from the rod and cone elements through the outer layer of the retinal nerve cells, but the fibres of the optic nerve are much more accessible and we can record the signals which emerge after leaving the nervous apparatus of the retina. Illuminating the retina starts a discharge of impulses and these increase in number and frequency as the intensity of the light increases; the strength of each individual impulse, however, is constant and unaffected by the light intensity. One unexpected phenomenon is that known as the "off discharge": with most of the vertebrate eyes so far examined, turning off the light gives a discharge of impulses as great as, or greater than, that given by turning it on.

Detailed studies of the optic nerve discharges have been made by Hartline in America and by Granit in Sweden and we know now that the nervous connections in the retina do not merely allow two bright regions to reinforce one another; they can also work the other way, suppressing or inhibiting one discharge in favour of another. Hartline has found, for example, that a large area of the retina brightly lit will suppress the signals coming from neighbouring areas, whereas if the retina is in darkness the feeble illumination of one point will reinforce that of another at some distance from it. Thus in bright light the contrasts between light and dark areas will be exaggerated and in semi-darkness perception of form will be sacrificed to perception of light.

### Size and the Threshold of Visibility

Dr. Adrian then referred to work carried out by Abney in 1897 on the illumination needed to make a white patch on a black background just visible to the dark-adapted eye. Within limits, the larger the patch, the dimmer the light needed to make it appear. Up to an area of 0.6 sq. mm. on the retina, the threshold intensity increased inversely as the area so that the total quantity of light required to make the patch visible remained

constant. While converging connections alone would account for a summation of stimuli over the territory connected with a single nervous pathway, true interaction would be needed to give such a precise integration over so many receptor elements, thousands of rods leading to well over 100 fibres of the optic nerve.

Colour, said Dr. Adrian, had always been the centre of interest in experiments with human vision but there was so far very little evidence to show where this elaboration of the visual image took place, although almost certainly some of it occurred in the retina.

**The Problem of the Illuminating Engineer**

In his concluding remarks Dr. Adrian asked the question, "What has all this to do with the science of illumination?" and his answer was, "Very little." One thing it could do, he said, was to remind us that our visual apparatus was handed down to us from animals unaccustomed to artificial light. How our nervous system learnt new habits was still one of the major problems of physiology. Certainly it was a highly adaptable organisation, but what we liked and what we could tolerate when the picture of the outside world was presented to our eyes by artificial lighting involved all sorts of factors which could not be analysed as yet in terms of nerve cells and signals in nerve fibres. "Until," said Dr. Adrian, "we know far more about the activities which take place at the highest level, in the brain, we must leave aesthetic considerations to the psychologist, or we must decide them by the time-honoured method of trying the new way of lighting and seeing whether we like it or not."

A vote of thanks was proposed by Mr. H. C. Weston, the honorary secretary of the Illuminating Engineering Society, who said that the illuminating engineer could not possibly know too much about sight; it was the very reason for his existence. The lecturer had shown a wonderful capacity for making his subject intelligible to an audience, most of whom were not physiologists. The vote of thanks was seconded by Prof. W. D. Wright and was heartily applauded by all those present, among whom it was gratifying to see Lady Paterson and members of her family.

# Research and the Lamp

**Report of a public lecture given in Liverpool recently by Dr. J. N. Aldington.**

A gathering of close on 2,000 people listened for nearly two hours in the Liverpool Philharmonic Hall on January 29 to Dr. J. N. Aldington, B.Sc., managing director and director of research, Siemen's Electric Lamps and Supplies, Limited, deliver a fascinating lecture dealing with "Research and the Lamp."

Organised by the Merseyside Electric Lighting Services Committee, representing M.A.N.W.E.B., the Liverpool branch of the Electrical Contractors' Association, the local Advisory Committee of the Lighting Service Bureau, the Illuminating Engineering Society, and the Liverpool Electrical Wholesalers, the lecture was the outstanding event of the year. The audience included a number of young people, among whom were 500 sixth-formers from local schools, who had received special invitations and who showed a keen interest in the lecture.

The Lord Mayor of Liverpool (Alderman A. Morrow), who presided, said that the objects of the committee were to present the facts and possibilities of electric lighting to the people, and thus to play a part in achieving that most desirable object—a brighter Merseyside. The committee had been fortunate in securing the services of Dr. Aldington, who had achieved a world-wide reputation.

On the platform was a quantity of apparatus which presented the appearance of an evening with the Magic Circle, and with these installations Dr. Aldington illustrated his lecture, which carried him from the early days of electric lamps through much research work and many experiments up to modern times.

Dr. Aldington referred to his visit to Liverpool three years ago, and stressed the

great work that had been done by way of research. In the early days of the electric lamp industry, he said, developments were largely the result of independent research work. There was then little or no organised research as it is known to-day, and therefore continuous work proceeded relatively slowly and contributions were made from all parts of the civilised world. Basic developments were made by independent scientific workers, many of whom subsequently became famous in the history of science, and such names as Edison, Swan and Fleming came readily to mind.

To-day the picture was very different, and they had reached a stage when most industries either subscribed to the great research institutions or themselves maintained industrial research laboratories. The electric lamp industry prided itself that it was the first to realise the importance of research, and that many large engineering laboratories owed their origin and beginnings to men who had grown up in the electric lamp industry and in lamp research laboratories.

He said that in his lecture he wanted to give a picture of some of the ramifications of lamp research, and to try to indicate the impact of research on developments in the electric lamp industry and also the directions in which researches and developments primarily intended for the benefit of that industry had caused developments in many other fields.

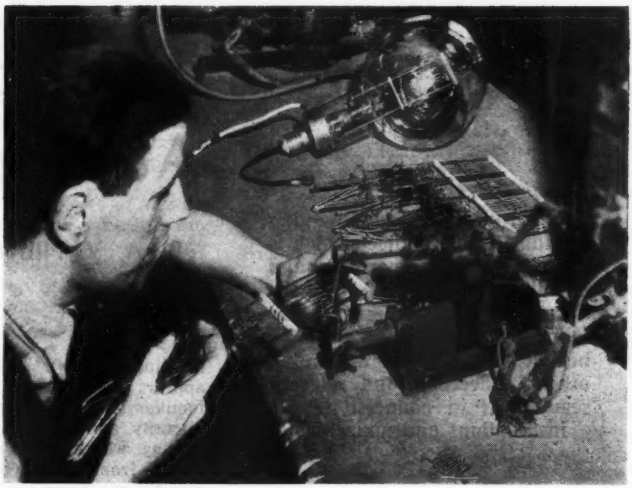
Research was directed towards improving the quality of existing light sources, to investigating new materials or phenomena which might have an influence on the development of new sources and also towards lamp and lighting applications and the production of better lighting systems to enable people to see with greater ease, to carry out their work more efficiently and to enjoy themselves with greater pleasure.

Dr. Aldington then reviewed the various methods of producing light by incandescence, electric discharge through gases and vapours and by fluorescence. He then went on to deal with glass, metals and gases, all of which are of such great importance in the manufacture of electric lamps. It so happens, he said, that glass is a vital material in one form or another in the construction of electric lamps and glass is not just a single substance, but its composition can be varied over very wide limits and there are many different types of glass. The glass technologists in the electric lamp industry have made major contributions to the development of hard glasses of the Pyrex type, similar to that used for kitchen and ovenware, and even much harder glasses are manufactured and used in the electric lamp industry as well as glasses produced by the fusion of quartz and the so-called silica glasses.

Quite often developments in the lamp field have awaited corresponding developments in the field of glass technology, and it is only when special glasses have been evolved that a particular objective long known and long sought after has been actually attained.

Research on glasses is, therefore, an important factor in lamp research. So, too, is

*Automatic mounting machine capable of mounting filaments at 15 times the speed of a hand operator.*



*Mounting of the filament of a 5-kw. lighthouse lamp.*

research on metals. It is quite astonishing how many different metals are used in the electric lamp industry and how great have been the contributions of the lamp industry to a knowledge of the metallurgy and methods of working, particularly of the comparatively rare and refractory metals molybdenum and tungsten.

In connection with gases he said that the electric lamp industry stood in a unique position. Not only are the gases nitrogen, hydrogen and oxygen used in considerable quantities in processes for the fabrication of electric lamps or the preparation of their components, but the rare gases helium, argon, neon, krypton and xenon have now all been brought into practical use in one way or another by research in the electric lamp industry.

He then proceeded with a series of practical demonstrations and emphasised the need for more continuous efforts on the part of local authorities and responsible people elsewhere at high level in the Government to allow some of those developments to be applied more effectively than they were to-day for street lighting and so help to reduce the appalling loss of life, and also to allow them to be applied more effectively in the home and in industrial and commercial premises.

The best lighting installations so far produced fell miserably short of the proper needs of the eye. It was only when those highly efficient plans were applied to a far greater extent than they were to-day that their many material benefits would be available to the great body of people. The matter, he agreed, was largely economical, but he emphasised that the majority of installations to-day were far short of what could be achieved if only the need was fully recognised and the importance of maintaining unimpaired the eyesight of little children was realised in the proper quarters.

"I trust the time will speedily come," said Dr. Aldington, "when these things will be possible, and when we in this industry will find much of the work we are doing being directed not towards things of war but to things of peace, and that the developments may take their proper place in the realm of civilisation."

A vote of thanks to Dr. Aldington was proposed by Mr. W. Gilchrist, Chief Commercial Officer of the Merseyside and North Wales Electricity Board.

Dr. Aldington expressed his thanks to the organisers, and especially the organising secretary, Mr. F. J. Burns, and he also referred to the valuable assistance he had had from his colleague, Mr. H. W. Cumming, and his staff, who had worked all day preparing for the demonstrations.

A vote of thanks to the Lord Mayor, proposed by Mr. C. C. Smith, Liverpool City Lighting Engineer, concluded the proceedings.

# Lighting in Hazardous Atmospheres*

By A. V. MILTON, Assoc. I.E.E.

**Flameproof and safety lighting in industry is a subject which is of considerable importance and is rightly receiving more attention than in the past. The following article reviews, for the benefit of lighting engineers and others concerned, the relevant regulations in connection with installations and apparatus.**

The use of safety lighting equipment in hazardous situations has been an obvious necessity in the coal mining industry ever since coal has been mined and the dangers of explosive atmospheres appreciated, but its application in other industrial fields has only become necessary in comparatively recent years as various industrial manufacturing processes have developed in which inflammable and explosive gases and dusts are present.

For many years there was very little data available of the characteristics of a number of inflammable gases and vapours but in the last 20 years a considerable amount of research has provided the information necessary for the techniques of flameproofing and intrinsic safety.

The following is a review of the relevant regulations and the standards now established in so far as lighting in industrial danger areas is concerned and gives some indication of current practice.

## Historical

The earliest development of safety lighting was, of course, in the mining industry at a time when electric lighting was not yet available and oil lamps were the predominant light source.

There is record of a curious early form of illuminant known as a Steel Mill, which appears very strange to lighting engineers familiar with modern standards of lighting intensity and safety; it consisted of a revolving wheel which struck a shower of sparks from a flint edge, the sparks supposedly not being hot enough to ignite fire damp. That it was described as a "fitful light" will not surprise even users of our modern petrol lighters.

Sir Humphrey Davy's invention in 1816 of the safety lamp was a great step in the direction of safety but the amount of light given in the early forms was very low and only after many years' development was the light improved by better combustion and better quality of the oil.

When electric filament lamps were first introduced into mines it was apparently thought that as the heated filament was not open to the atmosphere, further protection of the lamp was not necessary. It is an indication of the practice obtaining at the beginning of this century, when a well-known general reference book on electrical engineering published in 1904 makes the suggestion that all electric lamps fixed in mines should be protected by an outer globe to prevent accidents.

Incidentally, it is also interesting to learn in the same book that although many attempts had been made to introduce portable electric miners' lamps, up to that time they had met with scant success and, indeed, it was many years later before progress was really made in this direction.

In the industrial field the hazards and the precautionary measures necessary where possibilities existed of the presence of inflammable gases or dusts were only slowly appreciated even in the old-established industries such as gas works and oil

* Chairman's Address to the Liverpool Centre of the I.E.S.

refineries, and the development of safety electric lighting was in gradual stages from the protection of the lamps from mechanical damage by enclosing in well glasses, then later by double-well glasses and by making the enclosure supposedly "gas-tight" from ingress of the inflammable gases, until, with the research and experiments of the last twenty years, there has been evolved the present-day standards of safety lighting equipment and practice.

There is still a vast amount of research necessary to cope with the hazards arising from the ever-developing industrial processes, and there is scope for experiment and trials of new forms of light sources and fittings for application to safety lighting techniques.

### Necessity for the use of Safety Lighting

Safety lighting is necessary wherever there is a risk of danger of fire or explosion from the ignition of a gas, vapour, liquid or dust, and it is necessary for the preservation of life and property to take special precautions in the lighting installation.

The Annual Reports of the Chief Inspector of Factories contain interesting records of explosions and fires resulting from gas and vapours, and the last report, that of 1950, gives the following three main precautions in their order of importance:—

(a) Avoid the use of an inflammable material by choosing a non-inflammable one;
(b) Avoid inflammable concentrations of vapour;
(c) Avoid means of ignition.

It is suggested that there is a tendency to ignore (a) and (b) and to concentrate on the last, the very common fault of curing the effect and not the cause of the hazard.

It also reports that about 40 per cent. of all fatal accidents caused by fires and explosions in factories are due to ignition of inflammable liquids or their vapours.

The opening paragraph of section on Dust is worth noting: "Most materials that burn are capable of causing dangerous explosions when they are suspended in the air in the form of a dust cloud. For this reason the risk of explosion must be studied as soon as a combustible material is reduced by attrition to a fine flour or powder." Because of the very many industries which nowadays use inflammable liquids or have present inflammable fine dust in suspension it is necessary for the lighting engineer to be aware of the dangers and take the necessary precautions, bearing in mind that the extra cost of safety equipment may be offset by reduced fire insurance premiums."

### Statutory Regulations

Those responsible for designing safe lighting installations for use in factories must be aware of the obligations imposed by Statutory Regulations and of primary importance are the Electricity Regulations of the Factory and Workshop Acts.

The enforcement of these Regulations is the concern of the Factory Department of the Ministry of Labour through their Factory Inspectors.

These Regulations were made in 1908 and it is because they are couched in such broad terms that in spite of new developments and thought on various aspects of electrical engineering there has been no necessity for them to be amended except that in 1944 their application was extended to additional processes and places. They may almost be summarised by saying that every part of an electrical installation shall be safe to prevent danger to life and property.

It is the duty of the occupier of a factory to comply with the Regulations and also it is "the duty of all agents, workmen and persons employed to conduct their work in accordance with these Regulations." Any person employed failing to comply with them may be prosecuted and fined.

The important Regulations so far as safety lighting equipment is concerned are; Regulation 1, which says, "All apparatus and conductors shall be sufficient in size and power for the work they are called on to do, and so constructed, installed, protected, worked and maintained as to prevent danger so far as is reasonably practicable"; Regulation 26 which says, "All those parts of premises in which apparatus is placed shall be adequately lighted to prevent danger"; and Regulation 27 which says, "All conductors and apparatus exposed to the weather, wet, corrosion, inflammable surroundings or explosive atmosphere, or used in any process or for any special purpose other than for lighting and power, shall be so constructed and such special precautions shall be taken as may be necessary adequately to prevent danger in view of such exposure or use."

Under these Regulations it is obvious that factory inspectors have strong powers to insist on the use of safety lighting equipment in situations where they deem it necessary and to which the Factory and Workshops Acts are applicable.

With the rapid development of cellulose solutions and their use in a wide variety of

industries, often without a full realisation of potential dangers of the vapours and deposits arising from their use, it became necessary in 1934 to bring into being the Statutory Cellulose Solutions Regulations.

These are applicable to factories and workshops in which cellulose solutions are manufactured, used or stored, and, similar to the Factory Act, it is the duty of the factory occupier to comply with the Regulations, and there are also obligations on those using the solution.

The Regulations pertinent to lighting are 5(a), which says that no open light likely to ignite cellulose solutions or inflammable liquids or vapours shall be allowed within 20 ft. of any cellulose cabinet, space or store-room unless separated from it by fire-resisting material; and Regulation 5(b), which demands that lamp fittings liable to attain a temperature of 180 deg. F. shall be so placed that cellulose residues cannot be deposited on them.

Particularly with regard to cellulose paint spraying there have been developed many precautionary methods for avoiding the concentration of vapours and the deposition of the spray, so that special lighting equipment may not be required where these precautions are satisfactory, but it is advisable, and there should be no hesitation, to consult the Factory Inspectors if guidance or information is required as to the necessity or otherwise of using safety lighting equipment.

Premises where petroleum or explosives are stored are subject to the Regulations and Orders made under the provisions of the Petroleum (Consolidation) Act and the Explosives Acts for the operation of which the Home Office is responsible.

Under these regulations local authorities issue licences for storage and make conditions, included in which there are usually restrictions as to artificial lighting.

Following the investigations of the recent extensive petroleum storage fire at Avonmouth and also the fire disaster involving a garage in Bristol where petrol was stored, most local authorities are in the process of revising their conditions of licences, and more and more stringency is anticipated.

### Safety Lighting Equipment

Having decided that a situation is hazardous and calls for the use of safety equipment then this has to be acceptable to the Factory Inspectors Department and they will only accept either equipment which has been certified as safe by a Testing Authority, the recognised authority being the Ministry of Fuel and Power, or equipment which they approve for specific applications.

The Ministry of Fuel and Power delegate the testing of flameproof apparatus to the Mines Testing Station located in Buxton, hence certification is commonly referred to as a Buxton Certificate.

In recent years there has been close collaboration between the Testing Authority and the British Standards Institution, so that generally safety apparatus needs to comply with certain B.S.I. specifications before it is acceptable.

There are three of these specifications which are applicable to safety lighting equipment, and these deal with two classifications of equipment—(a) flameproof, and (b) intrinsically safe.

The first specification to be discussed is applicable to all types of electrical apparatus and is B.S. 229, 1946, Flameproof Enclosure of Electrical Apparatus, which defines the performance required from flameproof enclosure and the essential or desirable features of design.

There are often misconceptions as to what constitutes flameproof equipment — one engineer described a standard ironclad switch as flameproof because it would not ignite—and the confusion between flameproof and fireproof is common.

For some years it was customary to apply the term "gastight" to some types of lighting fittings, but this was a wrong application of the term because it is practically impossible to manufacture on a commercial basis lighting fittings which will remain gastight. The difficulty is that fitting covers have to be removed for lamp renewals and wiring connections, and even with compression jointing the possibility of maintaining a gastight joint is remote.

In any case, the use of jointing material is not permitted by the authorities, and it is impossible to make joints between bare machined faces gastight. In addition, the expansion and contraction of the internal air in a lighting fitting caused by the heating and cooling of the lamp results in a passage of air in and out through the joint, and any surrounding inflammable gas can be drawn into the fitting, with the risk of explosion should a lamp burst or a contact spark.

It is for this reason that this specification defines a flameproof enclosure as one that will withstand any explosion that may occur within it and will not permit the escape of flame to ignite inflammable gas in the surrounding atmosphere. The flameproofing is achieved by robust construction and by providing wide metal flanges at joints which

are machined to limits that ensure that the maximum permissible gap between the surfaces of the joint will, in the event of an explosion, cool and quench the flame before passing through. Usually each flange is machined to limits not exceeding half the maximum permitted gap, thus ensuring that when two flanges of a joint are assembled the maximum gap is not exceeded. The gaps referred to are permissible, not obligatory, and in effect are the tolerance allowed for deviation from true plane surfaces.

This specification also lists the various inflammable gases into four groups and lays down the maximum permissible gaps between joint surfaces, and as applied to air-filled lighting fittings the gaps range from .008 to .020 in., according to gas group. The variation in permissible gaps is necessary because the speed of flame travel varies with different gases, and the smaller the gap, the more quickly is the quenching of the flame. Group I is Methane (or firedamp), permissible gap .020 in., and this is not usually met in industrial processes; those in Groups II and III, permissible gaps .016 and .008 in., respectively, are the gases to be contended with industrially.

In Group IV are placed gases for which the safe gap is too small to be practicable for apparatus normally flameproofed, and therefore for situations where these gases are present there is not yet available any flameproof apparatus which can be certified safe. The gases at present in this excluded group are:—Acetylene, Carbon Disulphide, Hydrogen Water Gas, and Ethyl Nitrate.

It must be remembered that the list of gases given in this specification is not necessarily complete and will be added to from time to time as experiments and research make additional information available.

Quite an important feature of mechanical design is that the heads of bolts, studs, or screws used for securing doors or inspection covers must be shrouded or have some equivalent device. This is to limit the possibility of unauthorised persons opening the enclosure with the usual handyman's kit of tools, screwdriver, pliers or adjustable spanner, and compels the use of tubular box spanners or special key spanners. It is a common practice of lighting fitting makers to use triangular-headed screws which need special keys; these are a more effective deterrent than standard hexagon heads. To comply with this specification all apparatus has to be certified by the Ministry of Fuel and Power, either after individual test or type test or at the discretion of the testing

GROUPING OF INFLAMMABLE GASES AND VAPOURS AND CORRESPONDING GAP DIMENSIONS APPLICABLE TO LIGHTING FITTINGS*

| Group | Inflammable Gas or Vapour | Max. Permissible Gaps (inch) | |
|---|---|---|---|
| I | Methane (firedamp) | 0.020 | Coal Mines |
| II *a* | Blast Furnace Gas | 0.016 | |
| | Carbon Monoxide | ,, | |
| *b* | Propane | 0.016 | |
| | Butane | ,, | |
| | Pentane | ,, | Distilled from Crude Oil |
| | Hexane | ,, | |
| | Heptane | ,, | |
| | Iso-Octane | ,, | |
| | Decane | ,, | |
| *c* | Benzene | 0.016 | Derivatives from Coal Tar |
| | Xylene | ,, | |
| | Cyclo-Hexane | ,, | |
| | Ammonia | ,, | |
| *d* | Acetone | 0.016 | |
| | Ethylene | ,, | |
| | Methyl-Ethyl-Ketone | ,, | |
| | Methyl Acetate | ,, | Cellulose Solvents |
| | Ethyl Acetate | ,, | |
| | Propyl Acetate | ,, | |
| | Butyl Acetate | ,, | |
| | Amyl Acetate | ,, | |
| | Methyl Alcohol | ,, | |
| | Ethyl Alcohol | ,, | |
| | Iso-Butyl Alcohol | ,, | Paints |
| | Butyl Alcohol (normal) | ,, | |
| | Amyl Alcohol | ,, | |
| | Ethyl Ether | ,, | |
| | Ethyl Nitrite | ,, | |
| III | Coal Gas (Town's Gas) | 0.008 | |
| | Coke-oven Gas | ,, | |
| | Ethylene Oxide | ,, | |
| IV | Excluded Gases and Vapours | | |
| | Acetylene | | |
| | Carbon Disulphide | | |
| | Hydrogen | | |
| | Water Gas | | |
| | Ethyl Nitrate | | |

* Extracted from B.S.S. 229 : 1946

authority if deemed to be adequate without test.

Subject to licence and certain conditions the flameproof apparatus may be marked with the registered mark consisting of the outline of a crown containing the letters F.L.P.

B.S. 889, 1947, Flameproof Electric Lighting Fittings, applies to fixed fittings, well glass and bulkhead types and not to portable handlamps to be used with flexible leads. The mechanical construction features follow those laid down in B.S. 229, and in addition there are the detailed requirements appertaining to lighting fittings only.

A large section of the specification deals with well glasses and bulkhead glasses, and though other sizes are not precluded, there are six standard sizes of well glasses recommended in order to facilitate manufacture and effect economies of production, each size being for a particular wattage lamp.

The glasses must not have a light absorption greater than 10 per cent. per inch and shall not be ground, etched or roughened in any way to destroy the fire finish. The glasses have to be individually tested to a static hydraulic pressure varying according to size from 100 to 150 lb./sq. in., and makers have to guarantee that the glasses will withstand type tests for impact, thermal shock and durability.

A most important requirement applying to glasses is the fixing to the retaining rings, and this must be in accordance with the methods, and using the cements as specified in detail in B.S. 229. The approved cements are: (1) Litharge and glycerine; and (2) calcium sulphate; but others may be approved when data is available. The process of cementing the glasses to the metal housings is very exacting, and therefore it is considered essential that when replacement glasses are required they shall be obtained from the manufacturer and that they shall be supplied cemented into the metal housing.

The connection of external wiring to the fittings is covered by B.S. 229, and the main requirements are that the external conductors must not be taken into the main enclosure, a terminal box is to be provided to which the wiring is to be taken, the stems from the terminals taken into the main enclosure either through insulating bushes or insulating plates, and the cable entry is to be either through a sealing chamber or packing gland to close the passage.

A fundamental feature of flameproof lighting fitting design is that the temperature rise of any part of the external surface shall not exceed 50 deg. C. with an ambient temperature between 15 deg. C. and 35 deg. C.; this gives a maximum overall temperature of 85 deg. C. (185 deg. F.). On that account the wattage of lamps used in these fittings must not exceed the wattage marked on the fitting, otherwise the temperature rise may be excessive, and for the same reason the fitting must be mounted in the axial alignment, vertical, horizontal or inclined, for which the fitting is designed.

While this specified maximum temperature is considered reasonable in certain special conditions, such as cellulose spraying, it has been suggested in some quarters that it is unreasonably low for many hazardous situations, and some effort is being made to have this requirement reconsidered.

There are types of flameproof fittings, new designs and new techniques, not covered by B.S.I. Specifications and these may be submitted for approval and test by the testing authority, who may approve them for use in limited applications, or may give full flameproof certification.

A typical example is the fluorescent lamp fitting on which there has been considerable research and experiment in recent years using toughened glass and plastic enclosures: up to the present, only those with toughened glass enclosures have been given flameproof certification for industrial hazardous atmospheres.

As regards plastic enclosures for industrial applications there is still insufficient data on the effect of paint solvents on the plastic materials to warrant flameproof certification for Group II equipment, but limited approval has been given for coal face lighting in mines.

### Portable Handlamps

Although there are available a number of makes of portable handlamp for mains operation which have passed the tests of the testing authority none have been granted a full flameproof certificate and both the Factory Inspectors and the testing authorities frown on their use though realising that on occasion they are necessary. The reason for this discouragement is understandable as, though the fitting itself is safe, the danger is in the flexible connection to the supply.

Even in normal situations portable flexible leads are a source of danger but in hazardous areas they are much more so because, although the flexible cables may be heavily insulated or armoured they are generally prone to be grossly misused, walked on, run over, strained over sharp edges, and may suffer severe mechanical damage, with the consequent risks of, (a) unnoticed breakage of earth conductor making a potential

danger of shock or sparking should the metal work of the handlamp become alive and come in contact with a user or earthed metalwork, and (b) complete or partial severing or pulling out of the cable causing sparking which in a hazardous atmosphere would create a danger of ignition of gases.

A special precaution for dealing with earth faults may be adopted, using an earth-leakage protective device which will disconnect the supply on an earth fault occurring on the handlamp or the flexible cable, the cable requiring an earthed flexible metallic screen, in addition to the earth conductor, surrounding the conductor cores.

To guard against discontinuity of the earthing conductor a protective system of the circulating current type may be used which isolates the supply on the breaking of the earth conductor. This is achieved by using an additional conductor insulated from the earth conductor but connected to it to form a closed circuit in which a current normally flows. When the circuit is open a relay is de-energised and the supply cut off.

If portable lamps must be used, then, if possible, they should be used on a voltage less than 30 volts, which would reduce the risk of electrical breakdown and dangerous shock arising from mechanical damage.

There are also various makes of dry battery and accumulator handlamps which are approved by the factory department for use in industrial inflammable atmospheres, but these have only a limited light output. Where only a small amount of light is wanted it might solve the problem to use an intrinsically safe circuit for which there is B.S.I. specification.

B.S. 1259, 1945, Intrinsically Safe Electrical Apparatus and Circuits, concerns itself entirely with defining the term "intrinsically "safe" as applied (a) to a circuit, and (b) to apparatus.

A circuit, definition (a), is intrinsically safe when any sparking that may take place in it is incapable of causing an explosion of the prescribed inflammable gas.

Apparatus, definition (b), is intrinsically safe when it is so constructed that, when connected and used under prescribed conditions, any sparking that may occur either in the apparatus or in the circuit associated is incapable of causing an explosion of the prescribed inflammable gas.

So far as lighting is concerned, intrinsically safe circuits are usually limited to circuits fed from a small low-voltage transformer to low-wattage handlamps.

A type of transformer used has the output controlled by a resistance, so that in the event of the leads to the lamp being short-circuited no danger of overheating or ignition arises, but it is particularly important to understand that it is only the circuit between the resistance and lamp which is intrinsically safe, not the handlamp.

Fittings housing filament lamps cannot be intrinsically safe because the breaking of the lamp while in use would expose the heated filament.

**Compressed Air Systems**

There have been a variety of types of lighting systems developed using compressed air or gas in conjunction with forms of electric supply, and are so designed that flameproof fittings are dispensed with; these systems may be allowed in Group IV gas hazard areas.

In one type of system where main supply is used the fundamental principle is that all the apparatus in the hazardous area is "pressurised" by air or carbon dioxide at a pressure of about 5 lb. per square inch, which prevents the ingress of inflammable gases or dusts into the apparatus, and in the event of the failure of the pressure system the electric supply is isolated from the apparatus. This system permits the use of standard conduit systems and standard lighting fittings which are capable of being sealed to stand an internal pressure of 5 lb. per square inch.

Because of the subsidiary cables and the need for free flow of air larger sizes of conduit than normal are necessary, and it may be preferred to use a separate pipe line for the air, this, of course, being necessary where armoured or mineral insulated cables are being used.

Pressure switches, normally closed by pressure, are fitted in the system adjacent to the lighting fittings; a separate intrinsically safe circuit from the secondary of a transformer energises a relay coil connected in series with the pressure switches, the relay either directly switching the power supply to the lamps or through a circuit breaker. The circuit breaker, relay and transformer would need to be outside the danger area. Failure of the pressure switch circuit or the air supply de-energises the relay and isolates the power supply, thus the system "fails to safety."

Portable lamps are catered for by using a special coupling hose with a special portable handlamp incorporating a pressure switch, and if necessary to disconnect the portable lead a special type of socket can be provided with a hermetically sealing cover for when the lead is not in use.

It is recommended that portable lamps

should be operated at low voltage, and it is possible to incorporate a small transformer in the individual handlamp circuit with the transformer enclosed in the pressurised system.

Dependent on the size of the installation the pressure inside the system might be supplied from carbon dioxide gas cylinders with a pressure reducing device.

There are also the pneumatic electric systems which use light fittings incorporating a compressed air turbine and alternator, designed for working from compressed air lines giving 40-100 lb. per square inch. Types suitable for tungsten, mercury vapour and fluorescent lamps are available for wattages up to about 60, and all types may be termed semi-portable.

The alternators have a relatively high frequency and in consequence when mercury vapour or fluorescent lamps are used there is no stroboscopic effect. Also with these gaseous discharge lamps the chokes are eliminated and the higher striking voltages are achieved by special generator arrangement or load/speed control.

In one type of fitting the compressed air first flows into the interior of the well glass, passing out to the turbine and exhausts through a series of holes which give a curtain of compressed air round the outside of the well glass. Even if the well glass and lamp are broken and there remains momentarily a glowing filament, the air continues to flow round the lamp and the surrounding inflammable atmosphere cannot gain access for ignition. The turbine also ceases to run.

Other types have the air feeding the turbine first and then passing out to well glass or reflector chamber in which a back pressure is maintained which operates a diaphragm safety device and on failure of the back pressure through a leaking or broken lamp enclosure the alternator supply is cut off.

### Code of Practice

For general guidance on installation of safety lighting though not confined to lighting there is the British Standard Code of Practice, CP.1003, 1948, Installation and Maintenance of Flameproof and Intrinsically Safe Electrical Equipment, for industries other than coal mining.

An important point is made in the Scope 101(b) which states: "The Code is not intended to apply to areas where explosive or inflammable atmospheres normally persist, as no electrical apparatus should, in general, be installed in such areas."

Also important is Clause 201(d) which points out that flameproof equipment is normally designed for use in reasonably dry situations and special precautions should be taken in damp or humid conditions.

Where explosive dust is concerned clause 203(c) refers to the accepted method of greasing the flanges on assembly of the flameproof equipment. The reason for this method is that by filling the gaps with grease the dust is prevented from lodging in the flanges and acting as an ignition path from inside the fitting to the outside dust.

Well worthy of particular attention is Section 7 on maintenance, a subject which in normal lighting equipment is important for reasons of efficient use of the light source, but in hazardous conditions is primarily important for reasons of safety and the minimising of the explosion and fire risk.

As painting of equipment may be necessary either during installation or maintenance as a precaution against corrosion, it is as well to realise that aluminium paint should not be used as it has been established that under certain conditions sparks can result from this paint being struck by steel, copper, bronze or brass, and the sparks may be sufficient to ignite inflammable vapours.

Particularly with flameproof equipment is there the necessity that the installation and maintenance should be carried out by skilled persons who are well informed on the special technique involved and know the reasons for the mechanical and electrical features of flameproof design.

One other caution that must be made is that flameproof or intrinsically safe equipment is certified as being safe only when it remains in the condition as it is manufactured, any alteration, addition, subtraction or substitution may nullify the certification and possibly make the equipment unsafe for use for the particular hazard.

### Conclusion

In conclusion, it should be again stated that before any scheme is put in hand the Electrical Inspector of Factories should be consulted because the Factory Department have carried out much research and have wide experience of the many aspects involved in this extremely complicated technique.

The research organisations and manufacturers are carrying out extensive experimental work in solving the many problems that arise, there has been great progress made and there is still scope for development of new ideas to reduce the hazards and to reduce costs.

# French Code of Good Lighting Practice

**The recently published French Lighting Code is similar in many respects to the well-known British Code, but includes rather more information based on recent work on brightness.**

As mentioned in our issue for January, the French Society corresponding to our Illuminating Engineering Society, the Association Française des Eclairagistes (A.F.E.), has recently published a brochure entitled "Recommendations for the Lighting of Buildings and their Adjuncts." The publication has the support of the French counterpart of our Royal Society for the Prevention of Accidents, a fact which is not without significance.

The Recommendations follow quite closely the pattern of the I.E.S. Code and, in fact, agreement between the two documents has been aimed at deliberately, in accordance with the recommendation made by the International Commission on Illumination at its 1951 Session. Differences are mainly in the form of presentation and nowhere is there any divergence in principle.

The introductory section is much longer than that in the British I.E.S. Code and it contains an excellent statement of the basis on which the Recommendations are founded, referring to Weston's work and the way in which his results are applied to determine the illumination required for both good visual performance and visual comfort. A very important paragraph emphasises the fact that the Recommendations must not be regarded as coming in the same category as the law of the Medes and Persians; they are subject to revision with progress in the art and technique of light production and utilisation and "it will therefore be advisable, before referring to them, to make certain that the edition is not an old one, outdated as a result of scientific progress."

The relation between illumination and luminance is explained in this section and here the Recommendations have an advantage over the Code in that the term "luminance" is employed throughout; the unit in which values of luminance are expressed, the "nit," may, however, take some readers by surprise. This unit, equal to the candela per square metre, was adopted by the C.I.E. in 1951 as the natural metric unit for a quantity which is luminous intensity per unit area. It is, moreover, of a much more convenient magnitude than the earlier unit, the stilb (one candela per sq. cm.), for expressing the luminance of illuminated surfaces. It will be remembered that the French have always strenuously opposed the use of a unit of luminance based on that of a perfect diffuser under unit illumination, viz. the apostilb or the foot-lambert. It may be noted that 1 nit is equal to about 0.29 ft.-lamberts.

### Artificial Lighting

The first main section of the recommendations, with the above heading, deals with artificial lighting from the qualitative aspect. The principal subjects are the avoidance of glare, the effect of brightness distribution in the field of view, and the characteristics of different types of lighting units from the point of view of flux distribution.

Glare receives very detailed treatment in sub-sections dealing respectively with the effects of (i) the size of a source, (ii) its position in the field of view, (iii) its shape and (iv) the brightness of the immediate background and of the general surroundings. The somewhat surprising statement is made that linear sources are more liable to cause glare if vertical than if they are mounted horizontally. Another sub-section deals with reflected glare and this subject receives much more detailed treatment than in the British Code, a number of recommendations being made for eliminating or reducing it.

### Brightness Distribution

In the sub-section on brightness distribution the whole matter is gone into in considerable detail and extensive reference is made to the paper by S. D. Lay published in the I.E.S. Transactions for 1951 (No. 7, p. 172). It will be remembered that Mr. Lay suggested certain limiting values for the ratios of the brightness of (i) the 30 deg. diameter central field, (ii) the 30 deg. to 90 deg. surrounds and (iii) the peripheral field, to that of the task on which attention was being concentrated. The suggestions are reproduced *in extenso* in the French Recommendations and are supplemented by recommended values for the reflection factors of the ceiling (75 to 85 per cent.), walls (40 to 50 per cent. generally and 60 to 70 per cent. close to light sources), floor (20 to 30 per cent.) and work tables, machines, etc. (40 to 60 per cent.). The use of contrasting colours is recommended for certain purposes.

The last sub-section, dealing with the characteristics of the five different classes of lighting (direct, semi-direct, etc.), serves as a guide to the selection of the most suitable class for a particular purpose. Other matters referred to are the nature of the shadows formed with linear sources of light such as fluorescent lamps, and the importance of the colour of the light, with particular reference to artificial lighting used to supplement inadequate daylight.

### Daylight

The section on daylight is a short one and follows the lines of the British Code. The British and French references to sky factor are curiously complementary. The former explains it in general terms and indicates that it can be calculated but does not say how; the latter defines it formally by indicating how it is calculated but leaves the reader to guess its exact meaning as a measure of the natural lighting in a room.

There is another rather surprising difference between the two documents in the matter of the daylight required principally on the score of amenity. The British Code demands for this purpose a daylight factor of 0.5 per cent. or more over at least one-half of the area of the room; the French Recommendations prescribe this value for the "general lighting of the room," i.e., presumably over the whole area of the working plane. The use of roof lights is especially recommended in order to secure a high daylight factor and indeed the attainment of the 0.5 per cent. over the whole area of a room is not easy by the use of side windows only.

The familiar diagram in the British I.E.S. Code, showing for what period of the day, throughout the year, the average outdoor illumination exceeds 500 lm./ft.$^2$, has its counterpart in the French Recommendations. The figure of illumination taken is almost the same, viz. 5,000 lux, and the curves are based on ten years' observations at a site on the outskirts of Paris. The period is almost identical with that in the neighbourhood of London during the summer months, but in winter it is almost two hours longer, i.e., from 9 a.m. to 3 p.m. instead of from 10 a.m. to 2 p.m.

### Illumination Values

The third section of the Recommendations is concerned with the quantitative aspect of artificial lighting. Here again the treatment, although it differs in the manner of presentation, is fundamentally the same as that in the British Code. It is, perhaps, worth noting that the value of general illumination recommended on grounds of amenity and comfort, irrespective of the type of work, is slightly higher, viz., 70 lux instead of 6 lm./ft.$^2$. The relation between the values of general and local illumination, as exhibited diagrammatically in both documents, is precisely the same. Owing to the difference in the magnitude of the unit, however, the convenient relationship in the British Code, viz., that the number of lumens per sq. ft. of general illumination should not be less than the square root of the number of these units of local illumination, no longer holds; for instance, when the local illumination is 1,000 lux, the general illumination should be at least 100 lux and so on.

The double-page diagram in the centre of the British Code is reproduced in the French Recommendations, practically without change except for the unit employed. (It may be noted in passing that this diagram is also reproduced in the American I.E.S. Handbook, so that it is well on the way to becoming internationally recognised.) Even the use of large, medium and small numerals to indicate respectively general, general + local and mainly local lighting is the same, although there seems to be no reference to this in the text.

Almost half the French brochure consists of tables of recommended values. These occupy 16 closely printed pages and they are considerably more detailed and cover a wider field than the British tables. The latter contain rather more than 200 entries

grouped under 52 headings, whereas in the French tables there are over 700 entries in seven main groups sub-divided into 87 smaller classes. One outstanding example of the more detailed treatment is to be found in the group headed "Foodstuff Industry." Here there are sub-headings for slaughter-houses, meat storage, etc., meat processing, fish processing, vegetable packing, grain handling, baking, biscuit making, paté manufacture, coffee roasting, dairying, butter making, chocolate making, wine and spirit handling, sugar refining, cake making, and, finally, brewing. Each of these headings includes a number of individual processes and the total number of entries is over 100, compared with three entries in the British tables under the single heading "Food manufacturing and preserving." Whether so much detail is justified must be, to a great extent, a matter of opinion, but it is probable that some extension of the present tables in the British Code would be useful in any future edition. The Committee of the I.E.S. responsible for the Code might well consider also the inclusion of a paragraph such as that which occurs early in the final section of the French Recommendations and which reads as follows: "It is very evident that values of illumination represent only one of the factors which determine the excellence of a lighting system. . . . The figures given in these Recommendations are based on the assumption that, in addition, the best conditions of light distribution for the particular purpose considered have been achieved."

The tables in the French Recommendations conclude with two sections which do not appear at all in the British Code. These deal respectively with the illumination of outdoor areas and with the illumination required for floodlighting buildings constructed of different materials.

# A Street Lighting Experiment

As a contribution towards solving certain street-lighting problems the South Eastern Electricity Board are carrying out an experiment on high-mounted street lighting units with the object of finding a better method of lighting large areas generally associated with seaside towns. A further application would be to large squares in inland towns and the emphasising of important roundabouts, road junctions, and cross roads, thus making a contribution towards the reduction in road accidents.

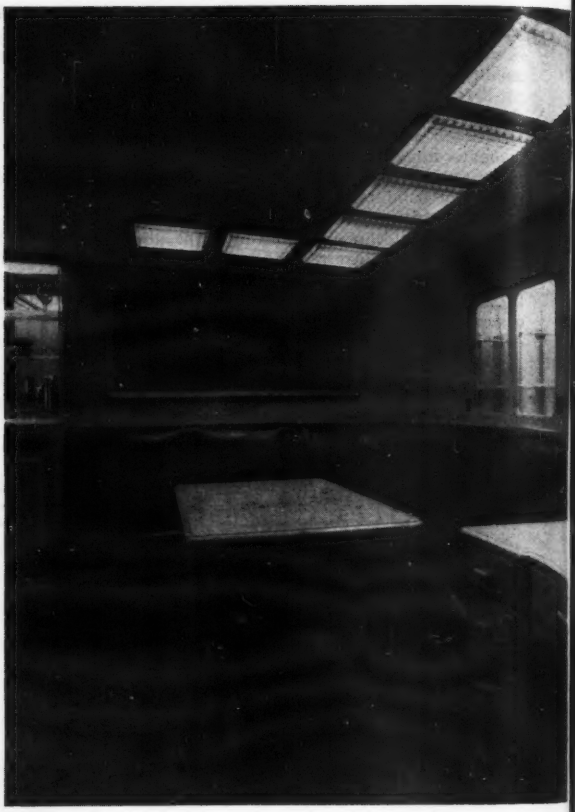
The experiment consists of a standard transmission pole of the lattice type supplied by Painter Bros. and four four-light fluorescent fittings supplied by the General Electric Co., Ltd., mounted as shown in the photograph at a height of 50 feet above ground level. This arrangement has been chosen to suit the layout of the Pyecombe fork which is along the main London to Brighton road (A23) at the junction of the Haywards Heath road (B2036).

The mounting height of fittings in the past has been largely governed by the average life of the light source, but fluorescent tubular lamps now having a life of 5,000 hours make maintenance a less serious problem. Raising and lowering gear has, however, been provided as part of the equipment.

Extremely good visibility is obtained for a length of at least one eighth of a mile, and the road intersection is very well

defined. This single installation gives an illumination of approximately 4 lm./ft$^2$ at a distance of 10 ft. from the pole, and at 200 ft. away 0.13 lm./ft$^2$ are produced, thus covering an area of more than 100,000 square feet.

# New Lighting Installations



### Lighting in a Yacht

Recently completed at Gosport, the auxiliary ketch *Aries* was designed and built by Camper and Nicholson for Mr. R. J. Reynolds, the well-known American yachtsman, to his own specification. She has an overall length of 92½ ft., with a beam of 19 ft., draught of 12 ft. and a displacement of 124 tons.

In addition to being the largest auxiliary yacht constructed in this country since the war, the *Aries* is almost certainly the most completely and luxuriously equipped. Many well-known firms have co-operated in providing equipment.

The available room on board has been used to the best possible advantage in housing the many modern navigational, handling and domestic aids. This has been done so neatly that there is an air of spaciousness below which produces the impression that she is considerably larger than her size.

The electrical installation alone serves as a yard-stick of the comprehensive character of the facilities on board. Lighting is on a generous scale. All cupboards and wardrobes, the refrigerators, and the galley oven are fitted with internal filament lamps and door switches. B.T.H. lighting engineers were asked to illuminate the saloon with lamps in recessed louvered fittings. The depth of the available space being only 2⅝ in., it was decided to use fluorescent lamps.

Specially made 14-watt fluorescent lamps are mounted in threes in eight recessed fittings behind diffusing glass and egg-crate louvering. The control gear is fitted behind a built-in settee.

### Lighting a Cricket School

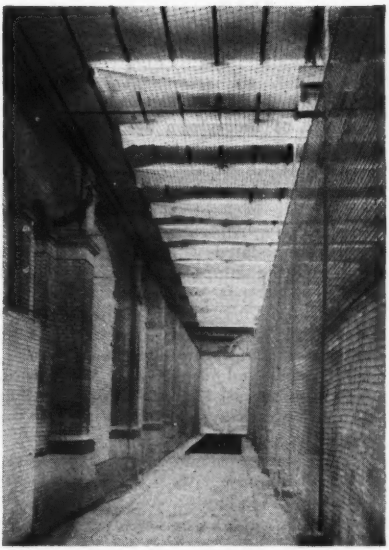
A new indoor cricket school was opened at Alexandra Palace by Sir Pelham Warner on behalf of the Middlesex Cricket Club at the beginning of the year.

Four pitches have been laid down and the design of the lighting installation, including the positioning of the false ceiling, was handled by the Illuminating Engineering Department of Ekco-Ensign Electric, Ltd., and it is no exaggeration to say that the school was virtually designed round the lighting.

Batten fittings, each with a single 5-ft. 80-watt fluorescent lamp, are mounted flush on the ceiling, at a height of approximately 20 ft., it being arranged that the beams to which the ceiling was fixed were positioned coincidentally with the proposed rows of fittings. The fittings were mounted in groups of three across the line of the pitch and were connected to a two-phase supply, alternate rows being connected to the same phase. In this way, any risk of the players experiencing stroboscopic phenomena was minimised.

Previous experience of indoor cricket has shown that a blending of two different coloured lamps taken in conjunction with the colour of the ceiling (which in this case was pale blue) produces the most natural and satisfactory lighting effect, and in this instance the "warm-white" and 3,500 deg. K types were used, fitted alternately both across and down the lengths of the pitches.

*View from the bowler's end.*



*View from batsmen's crease showing canvas pelmets eliminating batsmen's direct vision of the bare fluorescent lamps.*

In order that a slightly higher level of illumination should be provided in the batting area than at the bowling crease, the distance between rows of fittings was steadily increased from the centre of the school to the ends, in both directions. This resulted in a value of approximately 22 lm./ft$^2$ in the batting areas, falling off to about 17 lm./ft$^2$ at the bowler's run-up.

One problem was to avoid the batsmen having any direct vision of the bare fluorescent lamps, and this was successfully overcome by the provision of 12-in. vertical canvas pelmets fixed to the ceiling on the batsmen's side of each row of fittings.

In all, a total of 103 batten fittings were installed, resulting in a total electrical load of approximatey 10 kw.

This modern cricket school was of such public interest—as it is to be used principally for the training of our "young hopefuls"—that the B.B.C. televised a 35-minute programme at the school, when the B.B.C. engineers decided to dispense with their own lighting and used only the school's.

### Lighting a Canteen

The new works canteen of Marconi's Wireless Telegraph Co. Ltd., Chelmsford, is lighted by 12 60-ft. long continuous lighting features specially designed and produced by the Edison Swan Electric Co., Ltd.

These features are fitted close to the ceiling at either side of the six concrete barrel roofs, each of which covers a 40 ft. x 60 ft. bay. All cables and control gear are accommodated within the lighting features and the lamps are enclosed in clear ribbed "Perspex" covers which are designed so that each section can be inserted behind the next section when re-lamping, cleaning or maintenance work is being carried out. Eighty-watt 5-ft. fluorescent lamps are used in pairs throughout the lighting features to provide an initial illumination of 17/18 lm./ft$^2$.

The canteen was built under the direction of the architect, Mr. E. R. Collister, A.R.I.B.A., A.A.Dipl.

The electrical installation was carried out by Edmundsons Electrical Co. Ltd.

### Ship Lighting

In the new "Queen" of the Ellerman Lines' fleet, the 12,500-ton passenger liner *City of Port Elizabeth*, built by Vickers-Armstrongs, Ltd., the complete lighting installation has been carried out by The General Electric Company, Ltd. For this scheme, which employs both fluorescent and tungsten light sources in all spaces, 35 special designs of fittings were prepared by the G.E.C. in collaboration with the builders and with the owners' superintendents.

In the restaurant, verandah cafe and bar, drawing-room and writing room, hot cathode fluorescent tubes housed in the cornices give indirect lighting; these are supplemented by tungsten lamp fittings finished in matt nickel plate.

With oak armchairs and large easy chairs and settees in soft hide, the Jacobean-style furnishings of the smoke-room created a very restful atmosphere.

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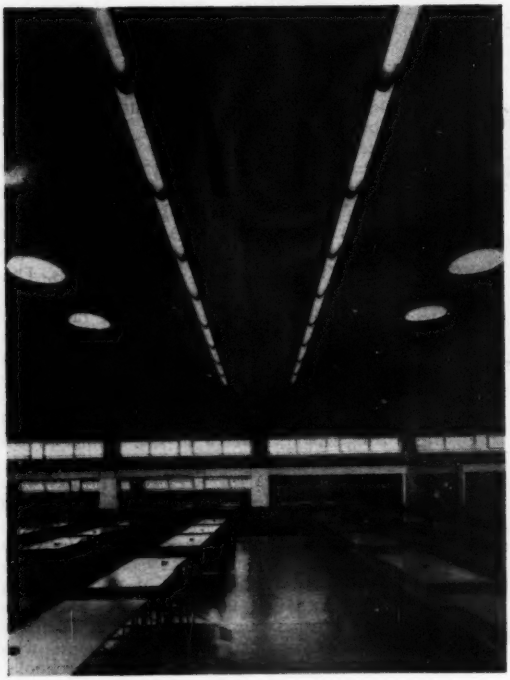
The installation shown on page 82 was carried out by Courtney, Pope (Electrical), Ltd.



*Lighting arrangements in the new works canteen of Marconi's Wireless Telegraph Co., Ltd.*

*Ceiling pendants and wall brackets lighting the smoking-room of the* City of Port Elizabeth.

*Indirect fluorescent lighting, supplemented by tungsten lamps, in the verandah café.*

# Correspondence

### New Illumination Trends

To the Editor, LIGHT AND LIGHTING.

Dear Sir,—As one who is a member of some standing in the Illuminating Engineering Society, and one whose name appears on the Register of Lighting Engineers, I have been most concerned recently with a new trend of illumination.

It has occurred to me that the illuminating engineer of to-day is largely a designer and not a prescriber of illumination and, in the main, he appears to be content to remain so.

What is his next step to be? His present position is in a field which is largely explored from the point of view of illumination. For many years he has depended upon the research work carried out in laboratories of public and private concerns and he seems to be content with their findings and would give an impression of being either unable or unwilling to go further.

The path blazed by the Illuminating Engineering Society is now reaching the boundaries of physics and, that being so, the work of the illuminating engineer is slowly but surely passing into the spheres of the specialised groups of the Physical Society. It is towards the work of these groups that the illuminating engineer must look for the new technique which will be required for his lighting schemes of the future.

I recently attended a series of lectures at the Imperial College, London, where principles of illumination were gone into at some length. The urgency of the position as far as the illuminating engineer is concerned must be obvious to any interested person and I have consequently been amazed at the complete absence of illuminating engineers from these specialist group meetings.

The point I would emphasise is that if a body such as the Physical Society, commanding as it does, the highest authorities in physics and the study of colorimetry can concern itself with lighting, then the illuminating engineer must look to the work of that body for future guidance.

More illuminating engineers must become participating members of the Physical Society specialist groups; they must attend the lectures of these groups and the knowledge they would obtain from these lectures together with the literature to which they would have access would prepare them for the new technique of lighting. In this manner they would acquire knowledge which would otherwise be denied to them for perhaps a further two or three years, were they to rely on the normal channels of their usual trade and technical journals and the local centres of their particular associations.

The specialist groups I have referred to concern themselves with optics, colour, electronics and architecture; in other words with everything that goes to make the complete illuminating engineer.

In times like these when scientific knowledge develops so rapidly, interested people must grasp with avidity knowledge made available to them by any such progress. To the illuminating engineer there is at hand a well of vast dimensions, overflowing with knowledge which will fit them for the future of lighting.

There is no time to waste: the knowledge is theirs for the seeking.—Yours, etc.

J. BERESFORD-HORNIBLOW.

*Birmingham.*

### Lighting Terms

To the Editor, LIGHT AND LIGHTING.

Dear Sir,—I am pleased to learn from the February issue of LIGHT AND LIGHTING that your powerful commentator *Lumeritas* is among those who consider that "Lumens per square foot" is too much of a sibilating mouthful for practical purposes. Most people will agree with him that the Aussie suggestion of "footlum" is not a suitable substitute, even if it be pronounced "footloom," as I feel sure that its inventor intended.

My purpose in writing, therefore, is to ask why we should seek to invent a substitute? For many years, until our rulers on the National Illumination Committee decided that their lighting and electrical qualifications gave them linguistic omniscience as well, we managed very happily with "foot-candles." It was simple, its construction bore a relation to its meaning that was obvious to all except the pedants, and its vigorous Anglo-Saxon syllables made it a pleasure to pronounce.

Let us revert to "foot-candles" and forget the 1.p.s.f.—Yours faithfully,

B. F. W. BESEMER.

*London.*

# REVIEWS OF BOOKS

*"Vision Through the Atmosphere" (W. E. Knowles Middleton; University of Toronto Press*, 1952). 246, *xiv. pp.*; 110 *Figs. and Index.*

In all problems of illuminating engineering outdoors, the properties of the atmosphere enter in some degree; whenever vision over ranges of more than a few hundred feet is involved, the properties of the atmosphere may become the ruling factor. The design of headlights, street lighting, railway and marine searchlights and camouflage, cannot be undertaken without a knowledge and understanding of the properties of the atmosphere, which are in some cases so complex and variable that a full solution has not yet been found.

For some years Mr. Middleton's earlier book, "Visibility in Meteorology" (Toronto University Press, 2nd edition, 1941), has been a standard work of reference. His latest book is not a new edition, but a new book, carrying much further the theories and information of the earlier volume and strengthened by the inclusion of much work done in all parts of the world on this complex subject during and since the Second World War. The author explains that the book is written with the emphasis on the physical and physiological bases of the problem, and the synoptic and climatological discussions of the earlier volume have been dropped. It is a book written by a meteorologist who is also a mathematical physicist on a subject embracing several sciences which "straddle the diffuse border between psychology and physics"; sciences in which the diffusion has often spread to the terminology and mathematics, and in which the unfamiliar reader struggling with a number of papers in several languages is doubly confused by almost irreconcilable conventions and notation. It is here particularly that he will turn with relief to Middleton, who possesses not only an unusual knowledge of the literature, but a clarity of thought which has enabled him to extract the relevant material, and to express it all in a coherent and consistent terminology and convention. His title is indeed a good description of his own mental approach. The reader must be prepared to follow him in a mathematical treatment, but will find that the algebra is constantly enlivened by a free and pungent style of writing rare in works of this kind.

An initial chapter deals with elementary photometric theory, not perhaps treated in the way most familiar to illuminating engineers, but so as to clear the way for subsequent chapters. Chapter 3 discusses the extinction of light by the atmosphere, giving the physical processes involved and experimental results. Chapter 4 discusses the alteration of contrast by the atmosphere. The author then turns in Chapter 5 to the relevant properties of the eye, and draws on a large mass of material by many workers. Chapter 6, on the Visual Range in Natural Light, includes a selection of the Tiffany nomograms for the calculation of visual range, but altered to give a probability of detection of 95 per cent.—a valuable feature, for the original very comprehensive series was intended for military use and referred to a low probability of detection inapplicable for civil problems. Chapter 7 discusses the visual range of light sources and illuminated objects at night. Chapter 8, dealing with the colours of distant objects and visual range of coloured objects, gives a concise and clear exposition of the C.I.E. system for specifying colour, and an interesting section on the colours of distant light signals seen through a selective haze. Chapter 9 describes a large number of instruments of many types for the investigation of atmospheric properties with an important section on errors in certain types of telephotometer. The selection would perhaps have been more complete had it referred to the very sensitive telephotometers described by Cameron, Rayner, Thomas and Winch (Symposium on Searchlights, I.E.S., London, 1948) with their exceedingly small acceptance angle; it might also have been worth while to point out that photometers measuring the luminance of extended distant sources are free from the error discussed. Two final chapters discuss the special problems of the meteorologist, and summarise the book. A plea is made for a review of the methods of reporting visibility, and for the proper use of reliable instruments. The matter is complicated by the fact that data are required both for synoptic meteorology, which is the chief preoccupation of the meteorologist for his own use, and also for the special purposes of air navigation, for which the requirements are rather different and a good deal more exacting. The difficulties of reconciling these two needs, in a large and complex service depending on observers of differing capabilities, are recognised sympathetically; but the author is impatient of those who would perpetuate observations which he is satisfied are meaningless.

There is a good bibliography, and an

index which is brief for a book with so much information.

J. M. W.

*Gründzüge der Lichttechnik* (*Bases of Illuminating Engineering*). *By R. G. Weigel. Pp.* 211; *Figs.* 158. *Verlag W. Girardet, Essen. Price DM* 18.20.

This book has been written by the author as a "concentrated epitome" of the many papers which he and his collaborators have contributed, at different times, to a wide range of journals and dealing with different aspects of illuminating engineering. At the same time, much additional matter has been incorporated, and the information given is thoroughly up to date.

As might be expected from the head of the Lighting Institute at Karlsruhe, the book will be especially valuable to the student of illuminating engineering. It begins with a reasoned account of the principal photometric quantities and their units; then follows a fairly long chapter on physiological optics and a very brief one on the modes of light production. Light sources and their characteristics are treated very fully in Chapter IV, and it is here that the inclusion of new and up-to-date material is most noticeable; in fact, book production in Germany must be a much more rapid process than in this country. The chapter on lighting fittings is a very successful one and this is followed by a treatment of lighting design which is unusually fundamental in its approach and free from the many airy generalities that seem to flow so readily from authors dealing with this subject. The final brief chapter is appropriately headed "Photometric Appendix."

The book should do much to assist the serious student of illuminating engineering in German-speaking countries, and both author and publishers are to be congratulated on having made a valuable addition to the literature of the subject.

J. W. T. W.

*Lichttechnik* (*Illuminating Engineering*). *By W. Köhler. Pp.* 582; *Figs.* 394. *Helios-Verlag, G.m.b.H., Berlin-Borsigwalde. Third edition,* 1952. *Price DM* 22.50.

A careful perusal of this book shows how difficult, if not impossible, it is now for one man to cover in detail the very wide range of topics covered by the title. A comparison with the very comprehensive "Handbuch der Lichttechnik," published in two large volumes some years before the war, would be unfair to the present book because, apart from the considerable difference in size, the "Handbuch" was the work of a large number of experts each treating his own particular field. Dr. Köhler has clearly had to rely quite considerably on information published in the literature of the subject and, for the most part, that available in the German language. It would appear, in fact, that he has addressed himself mainly to German readers, because in his list of 275 papers suggested for further reading, only five are by English authors, a few more are American, and the remainder are exclusively German or Dutch. This attitude also appears in the text which, with the numerous accompanying illustrations, refers almost entirely to German practice. The book should do much to assist in spreading a knowledge of the principles and practice of illuminating engineering in Germany.

J. W. T. W.

*"Electric-Wiring Diagrams," by W. Perren Maycock, M.I.E.E. Pp.* 156. *Figs.* 257. *Revised by A. Serner, for Isaac Pitman and Sons, Ltd., Parker-street, London, W.C.*2. *Price* 8*s.* 6*d.*

The title "Electric-Wiring Diagrams" suggests a somewhat wider scope than the material actually contained. Perhaps a more explicit title would be "Electric-Wiring Diagrams for the Installation and Maintenance Engineer."

The volume is divided into five sections covering distribution—lamps, signs, heating and motors, bells and telephones, and transformer layouts. It is not clear why lamp circuits and electric sign circuits occupy different sections or why motor circuits are grouped with heaters and cookers. Also a number of electric discharge lamp circuits are included in that section dealing with electric signs which seems somewhat illogical. Some rearrangement of the material would improve ease of reference.

In the section covering fluorescent lamp circuits the author might have included some reference to D.C. operation and to the range of voltages for which the various circuits are designed.

Apart from these minor criticisms this handy-sized book should prove extremely useful to engineers and students. The circuits are clearly explained in the text and the symbols used are those specified in British Standard No. 447. A useful extract of this Standard prefaces the volume.

W. A. R. S.

# I.E.S. ACTIVITIES

## London

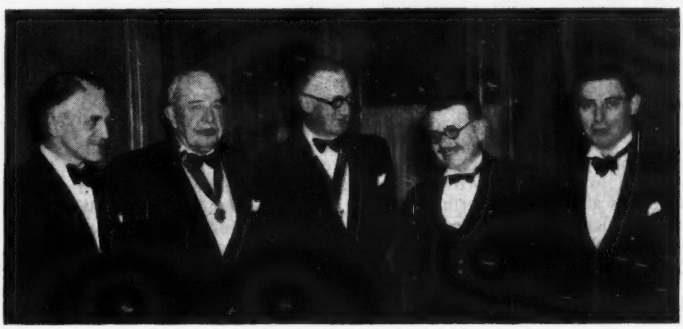
At the London meeting on January 13, Mr. P. D. Figgis presented a paper entitled "Some Aspects of Power Station Lighting."

Exterior lighting includes the lighting of roads, railway sidings, wharfs, coal-handling plant and storage areas where standard street lighting and area floodlighting technique is used. Fittings can be mounted on the faces of buildings, on the underside of overhead conveyor systems, or on standard poles. Additional lighting is required for unloading and reclaiming areas and is provided by floodlighting from cranes and grab towers. The local requirements of port area, municipal and transport authorities must be taken into account.

Boiler houses, however efficient, are always dusty. This necessitates all fittings being readily accessible for maintenance though the space is much congested and accessible positions are difficult to find. Lighting should provide a general illumination of 6 lm./ft.$^2$ over all working areas, except the firing aisle, which is the main centre of activity and should have 10-12 lm./ft.$^2$ The conveyor floor, weighing floor and firing aisle are usually one above the other, and are best lighted by fittings in line down the centre. The areas surrounding the boilers at the sides and rear at all levels can be well covered by units suspended from the roof trusses and from the walkways themselves. Overlamp-type reflectors simplify maintenance. Bulkhead units are suitable where head room is very restricted. Dust-excluding or dust-free fittings should be used throughout.

Turbine houses may be lighted by overhead or side lighting, and 10-12 lm./ft.$^2$ should be provided at operating-floor level. Overhead lighting may be supplied by large wattage tungsten lamps in high bay or concentrating reflectors. However, mixed lighting units, using mercury discharge lamps combined with tungsten, or multilamp fluorescent panels, are more efficient. All such units must be mounted at roof truss height to avoid the travelling crane. Side lighting, using fluorescent lamps, is now a practical proposition and probably provides the best method. The underside of the crane rail on either side gives an ideal position for almost continuous mounting of low brightness units. Maintenance either way is best carried out from the travelling crane.

The control room task is the reading of meters and keeping of records, and here 20-30 lm./ft.$^2$ of general illumination is required, with as much emphasis as possible on the panels and control boards, care being taken to minimise reflections in meter glasses. Consideration must be given to the angles of reflected light and the positioning of light sources to obviate reflections



*Guests at the annual dinner of the Birmingham Centre (left to right): Mr. Howard Long, Dr. Wellwood Ferguson, Alderman R. C. Yates, Dr. E. H. Norgrove and Mr. W. A. Gazard.*

at normal viewing angles. Duty in the control room is continuous night and day so that the design and brightness distribution must create at all times a cheerful atmosphere.

Power station lighting is incomplete without careful consideration of the requirements of switch houses, switch yards, pump houses, cable ducts, administrative offices, workshops, stores, etc. Emergency lighting must be incorporated to give safe passage to all control points in the event of any breakdown. Aircraft warning lights may be required for structures over 150 ft. high.

### Birmingham Centre

On January 2, 1953, members of the Birmingham Centre met at the College of Technology, Birmingham, where an exhibition of new lighting equipment was held.

These exhibitions are held by the Centre every two years and they are intended to demonstrate to all interested persons developments that have taken place in the various types of lighting fittings.

The greatest care has always been taken to make it perfectly clear to both exhibitors and spectators that the Centre is in no way connected with trade, or with advertising the equipment of any firm; this condition is strictly adhered to.

There was a record attendance with more than 100 visitors, in addition to members, demonstrating beyond dispute the number of people who are interested in lighting and its future.

From the points of view of attendance and the clarity with which each exhibitor explained, in the time allotted him, the main points of his particular design, the exhibition could be said to have been a success. Also it was reassuring to hear the interesting discussion which followed, where members were exhorted to bring home to the public at large the necessity for using better and more attractive types of lighting schemes, both commercially and domestically.

On the question of how much real development had taken place over the past two years, or even the previous six years, one was left a little dubious. It would seem that the main progress had been confined not so much to differences in design as to different types of more suitable material adapted to slightly improved older designs. One was also left wondering how much real development there can be in the design of, in particular, fluorescent fittings for many years to come.

The annual dinner of the Birmingham Centre was held on Friday, January 9, at the Midland Hotel, Birmingham. There was a large attendance and every section of the electrical industry was represented

In the unavoidable absence of the Lord Mayor the gathering was honoured with the presence of the Deputy Lord Mayor, Alderman R. C. Yates, who proposed "The Illuminating Engineering Society." This was responded to by Dr. W. J. Wellwood Ferguson, M.B., Ch.B., the Society's president.

The Deputy Mayor said how honoured he was to be present at such a distinguished gathering of members of the lighting industry. Dr. Wellwood Ferguson, in a very witty speech, stressed the importance of the cultural side of the Society and the necessity for opening the doors of membership to any person who was interested in lighting from any point of view at all. He also hoped that more members would contribute to the Society's publications articles dealing with their personal experiences. These would be of inestimable value to everybody.

"Our Guests" was proposed by Dr. E. H. Norgrove, chairman of the Centre, in a very able address to which Mr. W. A. Gazard responded in characteristic witty manner.

### Glasgow Centre

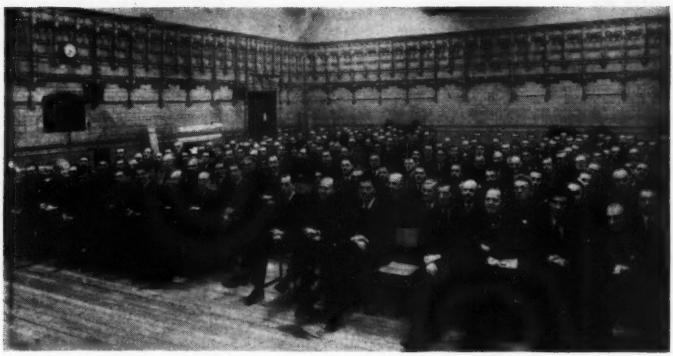
The fourth sessional meeting of the Glasgow Centre was held on January 8, 1953, at the Institute of Engineers and Shipbuilders, Elmbank-crescent, Glasgow.

Mrs. Buckland, of the Imperial Chemical Industries, Ltd., Paints Division, addressed the members on "Colour as a Framework to Industry." The lecture described in detail how a colour problem of factory decoration could and should be tackled to produce the best working conditions. Considerable attention and explanation was given to the various factors involved. It was with interest and amusement that the audience received word-pictures of the conditions that the author had encountered in factory painting. Mrs. Buckland concluded her lecture with a series of coloured photographs showing what can and should be achieved by the imaginative use of colour. The audience was enthusiastic and a large number of questions were submitted to the author.

### Leeds Centre

A well-attended meeting on January 26 heard Dr. W. H. Willott lecture on "The Physical Properties Governing Fittings Design."

Dr. Willott explained at the outset that the purpose of his lecture was to present the design considerations from a purely



*Showing the large number of members present at the Birmingham Centre meeting when new lighting equipment was exhibited.*

functional standpoint, and that he would not dwell on the aesthetic principles involved. The purpose of a lighting fitting, since it cannot increase the luminous output of the source, is to direct that output to useful purposes. Thus due to inefficiencies in the fitting, the general illumination decreases but the illumination in the required direction is normally increased.

Light control by reflectors and by refractors was demonstrated with the aid of slides, followed by an explanation of the methods of manufacture of diffusing glassware.

Dealing with lenses for optical systems, Dr. Willott described the developments which had taken place during the nineteenth century and emphasised the importance of the Fresnal Lens in which the amount of glass needed for its manufacture is reduced to a minimum and which has a more uniform thickness.

This latter point is of great importance in railway signal lenses, where the absorption of light varies with the thickness of glass, and ensures uniform brightness over the whole lens. In this country stepped lenses of up to 20-in. diameter are pressed in one piece.

For the remainder of the lecture, Dr. Willott discussed the application of optical systems to a great variety of uses, including car headlamps and railway signal lights, concluding with an interesting account of the developments of modern lighthouses and aerial beacon systems.

An interesting discussion followed, opened by Mr. Addison, who expressed surprise that the principles applied to railway signals were not followed in the design of traffic lights. Dr. Willott replied that the considerations of vehicles moving along any part of a wide road were different from those of a train traversing a fixed track. However, he agreed with Mr. Addison that there was a great need for better traffic light systems, and pointed out that in the United Sates a standard is set down specifying the character of the beam at over 30 different points.

### Nottingham Centre

On Thursday, January 8, 1953, three student members of the Society delivered their papers before a large and representative audience. The papers were "Stage Lighting," by W. Mosedale; "The Adaption of the Human Eye," by N. S. Rutherford; and "The Assessment of Discomfort Glare in Coalmines," by J. R. Wakefield.

The Centre committee decided to give three prizes to the authors for the work they had undertaken in preparing the papers and, following a ballot, they were awarded as follows:—1st, J. R. Wakefield; 2nd, N. S. Rutherford; 3rd, W. Mosedale.

## Forthcoming I.E.S. Meetings

**March 10th** **LONDON**

Sessional Meeting. Discussion on Post-War Building Studies No. 30, "The Lighting of Office Buildings." (At the Royal Society of Arts, John Adam Street, W.C.2.) 6 p.m.

**March 25th**

Informal Meeting. Series of short papers by student members. (At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.) 6 p.m.

**CENTRES AND GROUPS**

**March 3rd**

GLASGOW.—Annual Dinner and Social.

STOKE-ON-TRENT.—"Lighting of Television Studios." (At the Lecture Hall, 31, Kingsway, Stoke-on-Trent.) 6 p.m.

**March 4th**

EDINBURGH.—Annual Dinner and Social.

NEWCASTLE.—"Luminescence as Applied to Lighting," by H. G. Jenkins and A. H. McKeag. (At Roadway House, 6, Oxford Street, Newcastle-on-Tyne, 1.) 6.15 p.m

**March 5th**

NOTTINGHAM.—"The Lighting of Power Stations," by L. H. Hubble. (At the Demonstration Theatre of the East Midlands Electricity Board, Smithy Row, Nottingham.) 6 p.m.

EXETER.—"Outdoor Illumination," by H. A. Turner. (At the Providence Hall, Northernhay Street, Exeter.) 7 p.m.

**March 6th**

BATH and BRISTOL.—"Outdoor Illumination," by H. A. Turner. (At the Lecture Theatre of the South Western Electricity Board, Old Bridge, Bath.) 7 p.m.

**March 9th**

SHEFFIELD.—"Road Vehicle Lighting," by J. Nelson. (At the Medical Library, Sheffield University, Western Bank, Sheffield, 10.) 6.30 p.m.

**March 11th**

HUDDERSFIELD.—"Light and Other Radiations in Crime Investigation," by C. H. Edlin. (At the Electricity Showroom, Market Street, Huddersfield.) 7.15 p.m.

**March 12th**

BIRMINGHAM.—Annual General Meeting. (At Regent House, St. Philip's Place, Colmore Row, Birmingham.) 6 p.m.

MANCHESTER.—"Transport Lighting," by E. G. Wotton. (At the Demonstration Theatre of the North Western Electricity Board, Town Hall Extension.) 6 p.m.

**March 13th**

NOTTINGHAM.—Annual Ladies' Evening. (At the Victoria Station Hall.)

**March 18th**

NORTH LANCASHIRE.—"Lighting and Vision as Age Advances," by H. C. Weston. (At the Preston and Distric Chamber of Commerce, 49a, Fishersgate, Preston.) 7.15 p.m.

TEES-SIDE.—"Lighting for Schools," by J. W. Howell. (At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.) 6.30 p.m.

**March 19th**

GLOUCESTER and CHELTENHAM.—Film Show and Annual General Meeting. (At the General Electric Co. Ltd., 2, St. Aldgate Street, Gloucester.) 6.15 p.m.

**March 23rd**

LEICESTER.—"Display Lighting for the Coronation." (At the Demonstration Theatre of the East Midlands Electricity Board, Charles Street, Leicester.) 6.30 p.m.

**March 24th**

LIVERPOOL.—"Lighting in Shipyards," by J. S. McCulloch. (Joint Meeting with Manchester Ship Canal Committee and local Shipbuilders' Association.) (At the Lecture Theatre of the Merseyside and North Wales Electricity Board's Service Centre, Whitechapel, Liverpool, 1.) 6 p.m.

**March 26th**

BRADFORD.—"Fluorescent Forum." Questions and Answers. (At the Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford.) 7.30 p.m.

**March 30th**

LEEDS.—Annual General Meeting followed by "Lighting and Vision as Age Advances," by H. C. Weston. (At the Lighting Service Bureau, 24, Aire Street, Leeds, 1.) 6.15 p.m.

**March 31st**

CARDIFF.—"Development of Lamps other than Tungsten," by E. J. G. Beeson. (At the Demonstration Theatre of the South Wales Electricity Board.) 5.45 p.m

## Trade Literature

J. A. CRABTREE AND CO., LTD.—Information on the use of nylon instead of mica for the internal insulation in Crabtree "Standard" switches.

EKCO-ENSIGN ELECTRIC, LTD.—Latest price list of fittings, control gear, switches, lamps and lampholders, etc.

HIGH SPEED STEEL ALLOYS, LTD.—Informative article on "Creep Resisting Ferritic Steels for Gas Turbines."

GENERAL ELECTRIC CO., LTD.—Technical information sheet on Osram G.S.L. Lamps which are now fitted with fuses.

PRECISION COMPONENTS (BARNET), LTD.—New illustrated list describing the Kabi connector blocks and 12-way connector strips. Also particulars of bench assembly and storage trays.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—Current lamp catalogue No. 1000 covering a comprehensive range of lamps suitable for all lighting requirements.

SIMPLEX ELECTRIC CO., LTD.—Two specification folders which feature fluorescent lighting fittings and Lundberg door switches. Also well illustrated folder on commercial lighting units and leaflet on fluorescent lighting fittings price list.

STRONG ELECTRIC CORPORATION (GT. BRITAIN), LTD.—Useful catalogue presenting this company's range of industrial fluorescent lighting fittings and accessories; also contains an interesting section on technical information.

WARDLE ENGINEERING CO., LTD.—New folders dealing with glassware fittings, floodlight projectors, bulkhead and prismatic fittings, "workslite" reflectors, flameproof fittings, industrial fluorescent fittings, watertight fittings.

FOR ILLUMINATED GUARDPOSTS & EXTERNAL LIGHTING FITTINGS

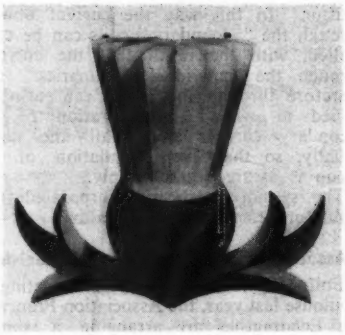
Gowshall Ltd., Rood End Rd., Oldbury, Birmingham. Tel.: BROadwell 2291/2. | Lamb's Conduit Passage, Red Lion Square, London, W.C.1 Ph.: Chancery 7042 & 7845

# Travelling Showroom
## for Coronation Fittings

Siemens travelling showroom, which carried a display of Siemens Chrysaline Coronation decorative devices, has recently completed an extensive tour of the country. The tour began on October 6, and most of the large towns between London and Glasgow and in the West Country have been visited. Chrysaline devices can be made in any shape, and the finished articles are as decorative by day as they are at night when internally illuminated. The material has the great advantage of being impervious to weather. Brilliant colours can be introduced into the material and the surface texture varied by the addition of nylon flock.

The devices offered by Siemens for Coronation decorations include crowns varying in height from 1 ft. to 4 ft., laurel wreaths and rings, Tudor roses, thistles, fleurs-de-lis and finials for poles and flagstaffs.

*Showing interior of travelling showroom.*



*Chrysaline Thistle available in various sizes, 2 ft. to 3 ft. in height.*

*Chrysaline Crown in four sizes— 1, 2, 3 or 4 ft. in height.*

# Overseas Notes

### Light Control for Fluorescent Lamps

In the January issue of "Lichttechnik" there is an interesting article by Dr. Erich Meyer on a method for regulating the light output from a group of fluorescent lamps. The article is based on a paper which Dr. Meyer read at the last session of the Berlin Illuminating Engineering Society.

In essence the method consists of putting each lamp individually in series with one coil of an inductor, the lamps in a group, each with its own inductor, being then put in parallel across the supply. The second coils of the inductors are connected in *series* with each other and with a regulating

resistor. In this way the current flowing through the "secondary" coils can be controlled, with the result that the currents through the individual "primaries" and therefore through the lamps can also be varied at will. Any alteration of the secondary current affects all the lamps equally, so that even regulation of the group is assured quite simply.

The system has been incorporated in a regulator termed the "Mutalux."

### Association Française des Eclairagistes

Following the success of their meeting in Toulouse last year, the Association Française des Eclairagistes are arranging a similar meeting to be held in Dijon from May 11—17 next. During the period of the meeting there will be large-scale floodlighting in Dijon and an exhibition of lighting equipment will be arranged.

It is understood that the technical meetings will be based on three main themes: light sources, light and life, and light and art.

Those requiring fuller details of the meeting should write to the A.F.E., 33, Rue de Naples, Paris, 8e.

### French Colour Council

An organisation called "Centre d'Information de la Couleur" has recently been formed in France with aims similar to those of the Colour Council in this country.

The first edition of their Bulletin has just appeared, and in addition to an introduction by Prof. Fleury, contains an article by Maurice Déribéré explaining the reason for the formation of the Centre (of which he is the secretary) and its activities. Those interested in receiving copies of the bulletin should write to M. Déribéré, Centre d'Information de la Couleur, 23, Rue Notre-Dame-des-Victoires, Paris, 2e.

### Nomenclature of Transmission Through a Plate

The German Standards Association has just published a proposed system of names for the various quantities which are involved when light passes through a plane parallel plate of a transparent medium. The simple conceptions of absorption factor and transmission factor are not sufficient because of the reflection which takes place every time light passes through the bounding surface of the medium in either direction.

The difficulties are well known to those concerned with the drafting of precise definitions, and the present document covers ground with which they are only too familiar. The simple "absorption factor" is the difference between unity and the ratio of the flux emerging from the plate to that incident on it. This ratio itself is the simple "transmission factor."

For many purposes, however, it is necessary to define the ratio of the flux arriving at the second surface of the plate to that leaving the first surface, *all inside the plate*. This has been termed the "internal transmission factor" in this country and the German document (DIN 1349) proposes "Durchsichtigkeitsgrad." Then there is the corresponding quantity for a plate of unit thickness. This property of the material, termed in English "transmissivity," is called "Durchsichtigkeitsmodul" in DIN 1349. "Extinction coefficient," the logarithm to base *e* of the reciprocal of the transmissivity, has a similar name in German, but the proposed document distinguishes between the logarithm to base *e* (natürlicher Extinktion) and the logarithm to base 10 (dekadischer Extinktion). It seems that the latter is the more generally employed in Germany and that if the word Extinktion is used alone, it is the logarithm to base 10 that is meant.

The terms to be used in the case of a transparent solution, when it is desired to have a quantity characteristic of the solute, are also set out.

The present document is only a draft, published for comment; the latest date for the receipt of comments is April 30.


## SITUATIONS VACANT

LIGHTING ENGINEER is required as assistant to Managing Director to supervise contracts, etc., by firm of Electrical Fittings Manufacturers in Knightsbridge.—Box No. 843.

A VACANCY will shortly occur for a Young Lady to act as Assistant to the Editor of LIGHT AND LIGHTING. Must have knowledge of editorial work and/or advertising; shorthand and typing essential. Write only, giving details of qualifications and experience to the Editor, LIGHT AND LIGHTING, 32, Victoria-street, S.W.1.


## Catalogues Wanted

Mr. Bent Knudsen, of Lumi, Ltd., Lergravsvej, 53, Copenhagen S., Denmark, would be pleased to be placed on the mailing list of firms manufacturing lighting equipment to receive copies of all catalogues.

PHILIPS LIGHTING NEWS

# MUCH EASIER MAINTENANCE OF FLUORESCENT LIGHTING

## *Replacement of lamps all that is needed with Philips Instant-Self-Start System*

BESIDES lighting up *at once* without any flickering or blinking, Philips Instant-Self-Start System makes maintenance far easier and quicker than with ordinary fluorescent lighting. Chokes, capacitors and starters are completely eliminated, so there is absolutely nothing to be done except occasional replacement of the lamps and, of course, normal cleaning. It is just as easy as maintaining ordinary tungsten lighting. No technical skill required of any kind.

### HIGH EFFICIENCY

The overall luminous efficiency is about 22 lumens/watt initial ("Natural" or "Daylight" fluorescent) or double that of ordinary tungsten lamps. The substantial total light output reduces the number of lighting fittings required.

### PLEASING COLOURS

Philips Self-Start Fluorescent Lamps are made in "Natural", "Daylight" or "Mellow" colours. "Colour Matching" is also available.

### HIGH POWER FACTOR

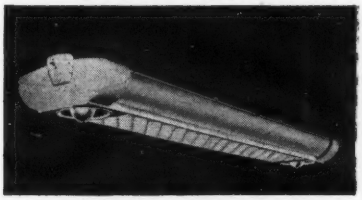
The operating circuit has the inherent high power factor of about 0.97.

### LONG-LIFE LAMPS

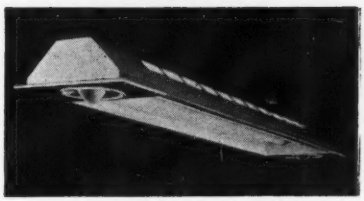
The long life of the lamps — together with their high efficiency and simplicity of maintenance — makes the Philips Instant-Self-Start System the most economical of all methods of fluorescent lighting.

### FITTINGS

There is a complete range of fittings to suit all requirements.
Here are just two examples :—



*"Alva" for general use.*



*"Arbroath" for industrial lighting.*

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LD231

# POSTSCRIPT

## By "Lumeritas"

According to the daily Press, the Westminster City Council has declined to install flashing beacons at the Z-crossings in its area on the ground that further experimentation is required to establish the value of this method of indicating the presence of the crossings. Some adequate luminous marker of the crossings there must be at night; and, I understand that, so far, trials have shown flashing beacons to be most effective. Other systems seem to be either less effective or even more expensive. The "resistance" of Westminster arises, I think, because the council is not satisfid that the superiority of flashing beacons has been convincingly demonstrated, and so the cost of installing them is not justified. I do not share this scepticism concerning flashing beacons, but, if it is at all widespread, then the sooner further trials are undertaken to establish their relative value unequivocally the better. The trial of different marker systems under strictly comparable conditions as to surroundings, traffic flow, weather, etc., and on a reasonable scale, is very difficult to contrive and would take quite a long time. Meanwhile, the present unsatisfactory night-visibility of Z-crossings would, presumably, be allowed to continue.

Although it has nothing to do with lighting, I cannot refrain from amusing my readers by the following note culled from "A Week-day Page for Women" in a monthly magazine. "*Bloodshot eyes.*—To cure a bloodshot eye, caused by cold, try tying a red silk handkerchief over it at night. I have found this works.—Miss B. B." From the last sentence it is plain that the writer subscribes to the pragmatic theory of truth and is happily untroubled concerning the *rationale* of the treatment she advocates. Does it work because, when confronted with a red handkerchief, the bloodshot eye realises it cannot compete in redness and so abandons the attempt? Does the redness of the handkerchief shame the redness from the eye? Would a dose of red light work as well? If "my love is like a red, red rose," will a red rose blanch her eyes? Can a ruddy eye be kept so—or even encouraged to become ruddier still—if the bandaging handkerchief is green or blue and not of gory hue? These are questions Miss B. B. does not pose to herself: her's not to reason why, her's but to trust the dye! In case this note suggests a catholicity of taste in reading matter, which I do not have, let me add that the mystery of the red silk handkerchief was brought to my notice by a member of the fair sex.

While on the subject of colour, it is interesting to note what variety of colour is being used in decorating some of our new school buildings. Mr. [illegible]edd—a "colour-minded" architect who has had a good deal to do with the design of brighter and more colourful schools since the termination of the war—read a stimulating paper on this subject to a joint meeting of the I.E.S. and the R.I.B.A. in London last month. The coloured slides he showed illustrated school interiors vastly different from the rather drab and forbidding ones which were common in my long-past schooldays. But what conflicting views there are upon colour-treatments of buildings. For example, how many of us would agree that dark brown is a good colour for the decoration of a restaurant or a night-club? Yet this is the suggestion of an interior decorator who was the subject of a recent paragraph in a London evening paper. "Far from being gloomy," he is reported as saying, "dark brown makes the ideal background for women's dresses. You have only to look at the old masters to see the effect I mean." The friend who drew my attention to this statement pointed out that few, if any, of the old masters actually did use dark brown as a background colour. The brown appearance of old pictures is often due to age-discoloured varnish: where this has been removed it has been usual to find such background colours as blue, green and maroon.

As was expected, plans are being laid to make London a blaze of light during the Coronation period. Floodlighting on an unprecedented scale is contemplated by the L.C.C., and it appears that the whole of the Thames area at Westminster and the opposite South Bank is to be resplendently illuminated at night.